PHILIPS

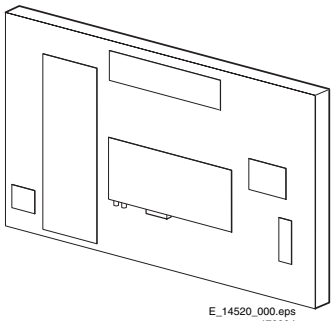
15PF8946

MODEL

SERVICE MANUAL

LC4.1E
AA

Service
Service
Service



Service Manual

Contents			Page	
1.	Technical Specifications, Connections, and Chassis Overview		2	
2.	Safety Instructions, Warnings, and Notes		4	
3.	Directions for Use		6	
4.	Mechanical Instructions		7	
5.	Service Modes, Error Codes, and Faultfinding		9	
6.	*Block Diagrams, Testpoint Overviews, and Waveforms*			
	Wiring Diagram		15	
	Block Diagram Audio & Video		16	
	Block Diagram Scaler & Supply		17	
	Testpoint Overview TV & Scaler Board		18-19	
	Testpoint Overview Front IR / LED Panel		20	
	I2C Overview		21	
	Supply Voltage Overview		22	
7.	*Circuit Diagrams and PWB Layouts*		*Diagram*	*PWB*
	Tuner & VIF	(Diagram A1)	23	32-33
	Hercules	(Diagram A2)	24	32-33
	Hercules Supply	(Diagram A3)	25	32-33
	Audio Amplifier (2x2W)	(Diagram A4)	26	32-33
	TV-Supply	(Diagram A5)	27	32-33
	Scaler	(Diagram A6)	28	32-33
	Scaler LVDS	(Diagram A7)	29	32-33
	Scaler IO	(Diagram A8)	30	32-33
	Supply	(Diagram A9)	31	32-33
	Rear IO Scart	(Diagram A10)	31	32-33
	Side AV Panel	(Diagram D)	34	35
	Top Control Panel	(Diagram E)	36	36
	Audio Amplifier (2x5W) (20 & 23")	(Diagram I)	37	38
	Front IR / LED Panel	(Diagram J)	39	39

Contents		Page
8.	Alignments	41
9.	Circuit Descriptions	45
	Abbreviation List	49
	IC Data Sheets	51
10	Spare Parts List	54
11	Revision List	57

©Copyright 2004 Philips Consumer Electronics B.V. Eindhoven, The Netherlands.
All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, or otherwise without the prior permission of Philips.

Published by BB 0469 Service PaCE Printed in the Netherlands Subject to modification EN 3122 785 14520

PHILIPS

1. Technical Specifications, Connections and Chassis Overview

1.1 Technical Specifications

1.1.1 Vision

Display type	:	14 inch: LCD-VA
	:	15 inch: DV-LCD-IPS
	:	17-23 inch: DV-LCD-IPS
Screen size:	:	14 inch (37 cm)
	:	15 inch (38 cm)
	:	17 inch (45 cm)
	:	20 inch (51 cm)
	:	23 inch (59 cm)
Resolution (HxV)	:	14 inch: 640x480 (VGA)
	:	15 inch: 1024x768 (XGA)
	:	17 inch: 1280x768 (WXGA)
	:	20 inch: 640x480 (VGA)
	:	23 inch: 1280x768 (WXGA)
Viewing angle	:	14 inch: 170x170 deg.
	:	15 inch: 130x100 deg.
	:	17-23 inch: 176x176 deg.
Light output	:	450 cd/m^2
Tuning system	:	PLL
Colour systems	:	PAL B/G, D/K, I
	:	SECAM B/G, D/K, L, L1
Video playback	:	NTSC, PAL, SECAM
Channel selections	:	100 channels
	:	PLL
Aerial input	:	75 ohm
	:	Coax

1.1.2 Sound

Sound systems	:	BI NICAM BG
	:	2CS BG
	:	FM/FM (5.5-5.74)
	:	(B/G)
	:	NICAM B/G (5.5-5.85)
	:	NICAM D/K (6.5-5.85)
	:	NICAM I (6.0-6.52)
	:	NICAM L (6.5(AM)-5.85)
Maximum power	:	14-17 inch: 2x2 W
	:	20-23 inch: 2x5 W

1.1.3 Miscellaneous

Power supply:		
- Mains voltage	:	90-240 V ac
- Mains frequency	:	50 / 60 Hz
Ambient conditions:		
- Temperature range	:	+5 to +40 °C
- Maximum humidity	:	90 % R.H.
Power consumption		
- Normal operation	:	from 32 W
	:	to 110 W
- Standby	:	< 2 W

1.2 Connections

1.2.1 Rear Connections

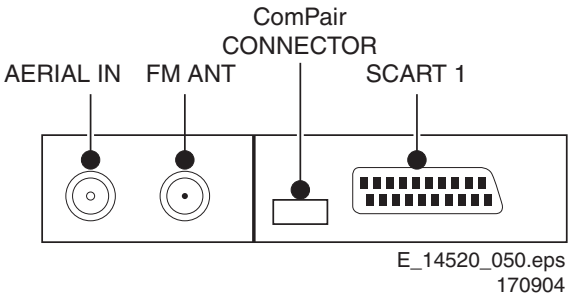


Figure 1-1 Rear connections

Aerial - In
- IEC-type Coax, 75 ohm

FM Ant
- IEC-type Coax, 75 ohm

SCART1: RGB/YUV - In, CVBS - In/Out, Audio - In/Out

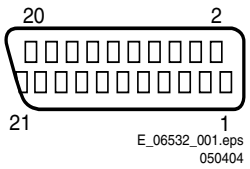
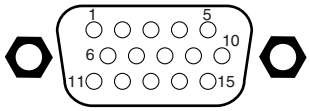


Figure 1-2 SCART connector

1	- Audio - R	0.5 V_rms / 1 kohm	⊖→
2	- Audio - R	0.5 V_rms / 10 kohm	⊖
3	- Audio - L	0.5 V_rms / 1 kohm	⊖→
4	- Audio - gnd	Ground	⏚
5	- Blue - gnd	Ground	⏚
6	- Audio - L	0.5 V_rms / 10 kohm	⊖
7	- Blue/U - in	0.7 V_pp / 75 ohm	⊖
8	- CVBS - status	0 - 2 V: INT 4.5 - 7 V: EXT 16:9 9.5 - 12 V: EXT 4:3	⊖
9	- Green - gnd	Ground	⏚
10	- n.c.		
11	- Green/Y - in	0.7 V_pp / 75 ohm	⊖
12	- n.c.		
13	- Red - gnd	Ground	⏚
14	- FBL - gnd	Ground	⏚
15	- Red/V - in	0.7 V_pp / 75 ohm	⊖
16	- Status/FBL	0 - 0.4 V: INT 1 - 3 V: EXT / 75 ohm	⊖
17	- Video	Ground	⏚
18	- Video	Ground	⏚
19	- CVBS - out	1 V_pp / 75 ohm	⊖→
20	- CVBS - in	1 V_pp / 75 ohm	⊖
21	- Shielding	Ground	⏚

VGA: RGB - In



E_06532_002.eps
050404

Figure 1-3 VGA Connector

1	- Red	0.7 V_pp / 75 ohm	⊕
2	- Green	0.7 V_pp / 75 ohm	⊕
3	- Blue	0.7 V_pp / 75 ohm	⊕
4	-	Ground	⏚
5	-	Ground	⏚
6	- Red - gnd	Ground	⏚
7	- Green - gnd	Ground	⏚
8	- Blue - gnd	Ground	⏚
9	- 5V_DC	+5 V_dc	⊕
10	-	Ground	⏚
11	-	Ground	⏚
12	- DDC_SDA	DDC data	⊕
13	- H-sync	0 - 5 V	⊕
14	- V-sync	0 - 5 V	⊕
15	- DDC_SCL	DDC clock	⊕

1.2.2 Side Connections

E_14520_051.eps
170904

Figure 1-4 Side connections

Mini Jack: Audio - in

4	- Audio - L	0.5 Vrms / 10 kohm	⊕◎
3	- Audio - R	0.5 Vrms / 10 kohm	⊕◎

S-VHS - In Hosiden

1	- Y	Ground	⏚
2	- C	Ground	⏚
3	- Y	1 Vpp/75 ohm	⊕
4	- C	0.3 Vpp/75 ohm	⊕

Video - In (Cinch)

1	- CVBS	1 Vpp/75 ohm	⊕◎

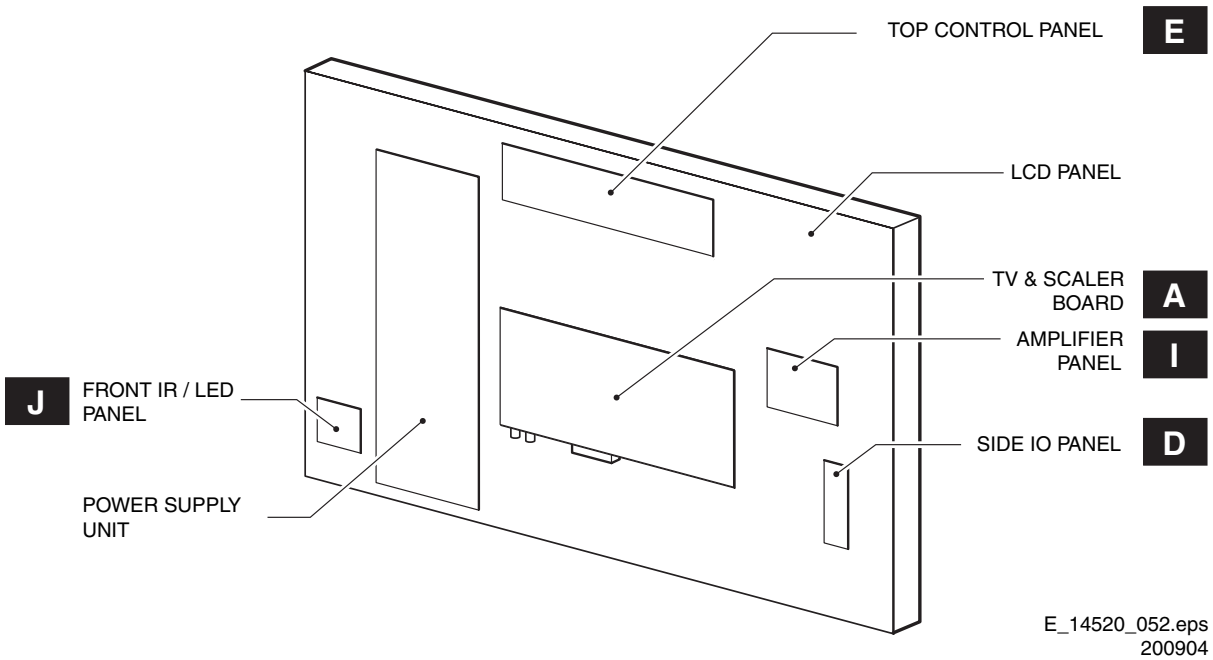
Audio - In (Cinch)

1	- Audio - R	0.5 Vrms/10 k ohm	⊕◎
2	- Audio - L	0.5 Vrms/10 k ohm	⊕◎

Jack: Headphone- Out

Bk	- Headphone	32 - 600 ohm / 10 mW	6.3mm

1.3 Chassis Overview



E_14520_052.eps
200904

Figure 1-5 Chassis Overview

2. Safety Instructions, Warnings, and Notes

2.1 Safety Instructions

Safety regulations require that **during** a repair:
- Connect the set to the Mains (AC Power) via an isolation transformer (> 800 VA).
- Replace safety components, indicated by the symbol ⚠, only by components identical to the original ones. Any other component substitution (other than original type) may increase risk of fire or electrical shock hazard.

Safety regulations require that **after** a repair, the set must be returned in its original condition. Pay in particular attention to the following points:
- Route the wire trees correctly and fix them with the mounted cable clamps.
- Check the insulation of the Mains (AC Power) lead for external damage.
- Check the strain relief of the Mains (AC Power) cord for proper function.
- Check the electrical DC resistance between the Mains (AC Power) plug and the secondary side (only for sets which have a Mains (AC Power) isolated power supply):
  1. Unplug the Mains (AC Power) cord and connect a wire between the two pins of the Mains (AC Power) plug.
  2. Set the Mains (AC Power) switch to the "on" position (keep the Mains (AC Power) cord unplugged!).
  3. Measure the resistance value between the pins of the Mains (AC Power) plug and the metal shielding of the tuner or the aerial connection on the set. The reading should be between 4.5 Mohm and 12 Mohm.
  4. Switch "off" the set, and remove the wire between the two pins of the Mains (AC Power) plug.
- Check the cabinet for defects, to avoid touching of any inner parts by the customer.

2.2 Warnings

- All ICs and many other semiconductors are susceptible to electrostatic discharges (ESD). Careless handling during repair can reduce life drastically. Make sure that, during repair, you are connected with the same potential as the mass of the set by a wristband with resistance. Keep components and tools also at this same potential.
  Available ESD protection equipment:
  – Complete kit ESD3 (small tablemat, wristband, connection box, extension cable and earth cable) 4822 310 10671.
  – Wristband tester 4822 344 13999.
- Be careful during measurements in the high voltage section.
- Never replace modules or other components while the unit is switched "on".
- When you align the set, use plastic rather than metal tools. This will prevent any short circuits and the danger of a circuit becoming unstable.

2.3 Notes

2.3.1 General

- Measure the voltages and waveforms with regard to the chassis (= tuner) ground (⏚), or hot ground (⏚), depending on the tested area of circuitry. The voltages and waveforms shown in the diagrams are indicative. Measure them in the Service Default Mode (see chapter 5) with a colour bar signal and stereo sound (L: 3 kHz, R: 1 kHz unless stated otherwise) and picture carrier at 475.25 MHz for PAL, or 61.25 MHz for NTSC (channel 3).
- Where necessary, measure the waveforms and voltages with (⊓⊓) and without (⊼) aerial signal. Measure the voltages in the power supply section both in normal operation (⏻) and in standby (⏻). These values are indicated by means of the appropriate symbols.
- The semiconductors indicated in the circuit diagram and in the parts lists, are interchangeable per position with the semiconductors in the unit, irrespective of the type indication on these semiconductors.
- Manufactured under license from Dolby Laboratories. “Dolby”, “Pro Logic” and the “double-D symbol”, are trademarks of Dolby Laboratories.

Figure 2-1 Dolby PL Symbol

2.3.2 Schematic Notes

- All resistor values are in ohms and the value multiplier is often used to indicate the decimal point location (e.g. 2K2 indicates 2.2 kohm).
- Resistor values with no multiplier may be indicated with either an "E" or an "R" (e.g. 220E or 220R indicates 220 ohm).
- All capacitor values are given in micro-farads (μ= x10^{-6}), nano-farads (n= x10^{-9}), or pico-farads (p= x10^{-12}).
- Capacitor values may also use the value multiplier as the decimal point indication (e.g. 2p2 indicates 2.2 pF).
- An "asterisk" (*) indicates component usage varies. Refer to the diversity tables for the correct values.
- The correct component values are listed in the Electrical Replacement Parts List. Therefore, always check this list when there is any doubt.

2.3.3 Rework on BGA (Ball Grid Array) ICs

General

Although (LF)BGA assembly yields are very high, there may still be a requirement for component rework. By rework, we mean the process of removing the component from the PWB and replacing it with a new component. If an (LF)BGA is removed from a PWB, the solder balls of the component are deformed drastically so the removed (LF)BGA has to be discarded.

Device Removal

As is the case with any component that, it is essential when removing an (LF)BGA, the board, tracks, solder lands, or surrounding components are not damaged. To remove an (LF)BGA, the board must be uniformly heated to a temperature close to the reflow soldering temperature. A uniform temperature reduces the chance of warping the PWB.
To do this, we recommend that the board is heated until it is certain that all the joints are molten. Then carefully pull the component off the board with a vacuum nozzle. For the appropriate temperature profiles, see the IC data sheet.

Area Preparation

When the component has been removed, the vacant IC area must be cleaned before replacing the (LF)BGA.
Removing an IC often leaves varying amounts of solder on the mounting lands. This excessive solder can be removed with either a solder sucker or solder wick. The remaining flux can be removed with a brush and cleaning agent.
After the board is properly cleaned and inspected, apply flux on the solder lands and on the connection balls of the (LF)BGA.

Note: Do not apply solder paste, as this has shown to result in problems during re-soldering.

Device Replacement
The last step in the repair process is to solder the new component on the board. Ideally, the (LF)BGA should be aligned under a microscope or magnifying glass. If this is not possible, try to align the (LF)BGA with any board markers. To reflow the solder, apply a temperature profile according to the *IC data sheet*. So as not to damage neighbouring components, it may be necessary to reduce some temperatures and times.

More Information
For more information on how to handle BGA devices, visit this URL: *www.atyourservice.ce.philips.com* (needs subscription, not available for all regions)). After login, select “Magazine”, then go to “Workshop Information”. Here you will find Information on how to deal with BGA-ICs.

2.3.4 Lead Free Solder

Some PWBs in this chassis are “lead-free **prepared**”. This is indicated on the PWB by the PHILIPS lead-free logo (either by a service-printing or by a sticker). It does not mean that lead-free solder is actually used!

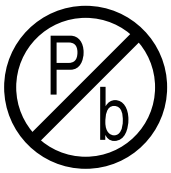


Figure 2-2 Lead-free logo

Due to this fact, some rules have to be respected by the workshop during a repair:

- Use only lead-free soldering tin Philips SAC305 with order code 0622 149 00106. If lead-free solder paste is required, please contact the manufacturer of your soldering equipment.
- Use only adequate solder tools applicable for lead-free soldering tin.
- Adjust your solder tool so that a temperature around 217 - 220 deg. C is reached at the solder joint.
- Do not mix lead-free soldering tin with leaded soldering tin; this will lead to unreliable solder joints!
- Use only original spare parts listed in this manual. These are lead-free parts!
- On the website *www.atyourservice.ce.philips.com* (needs subscription, not available for all regions) you can find more information on:
  - Aspects of lead-free technology.
  - BGA (de-)soldering, heating-profiles of BGAs used in Philips sets, and others.

2.3.5 Practical Service Precautions

- **It makes sense to avoid exposure to electrical shock.** While some sources are expected to have a possible dangerous impact, others of quite high potential are of limited current and are sometimes held in less regard.
- **Always respect voltages**. While some may not be dangerous in themselves, they can cause unexpected reactions - reactions that are best avoided. Before reaching into a powered TV set, it is best to test the high voltage insulation. It is easy to do, and is a good service precaution.

3. Directions for Use

You can download this information from the following website:
http://www.philips.com/support

4. Mechanical Instructions

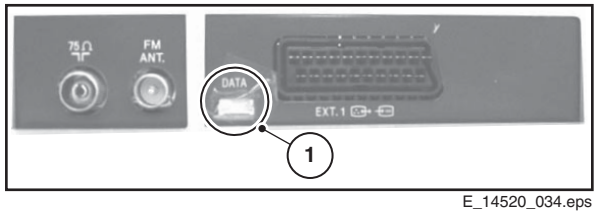
Index of this chapter:

1. Service Position
2. Rear Cover Removal
3. Power Supply Unit Removal
4. TV & Scaler Board Removal
5. Side I/O Panel Removal
6. Top Control Panel Removal
7. Audio Amplifier Panel Removal
8. Exchanging the LCD Panel
9. Re-assembly

Note: Figures below can deviate from the actual situation, due to different set executions.

Note: To diagnose the set with ComPair it is **not** needed to open the set entirely.
To access the ComPair connector, proceed with the following:
1. Manually unlock and remove the cover cap.
2. Remove the tape shielding that covers the ComPair connector (1).

Note: Make sure that both the ComPair connector and the UART connector are shielded off with a piece of insulating tape after repair for ESD reasons. Place this tape over the holes in the rear cover of the set.

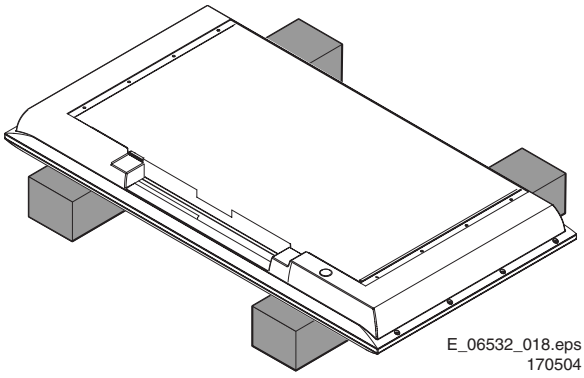


E_14520_034.eps
160904

Figure 4-1 ComPair connector

4.1 Service Position

4.1.1 Foam Bars

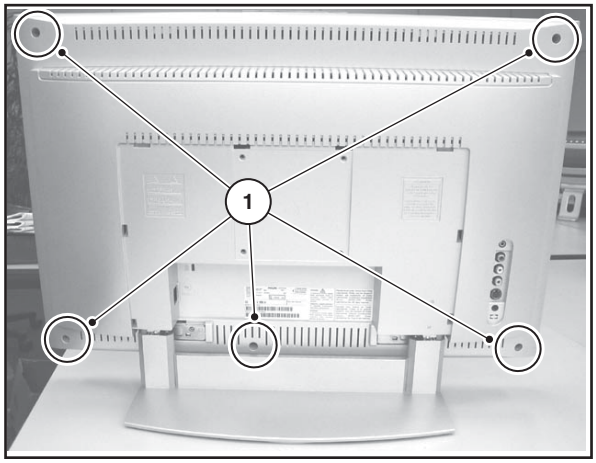


E_06532_018.eps
170504

Figure 4-2 Foam bars

The foam bars (order code 3122 785 90580) can be used for all types and sizes of Flat TVs. By laying the plasma or LCD TV flat on the (ESD protective) foam bars, a stable situation is created to perform measurements and alignments. By placing a mirror under the TV, you can easily monitor the screen.

4.2 Rear Cover Removal

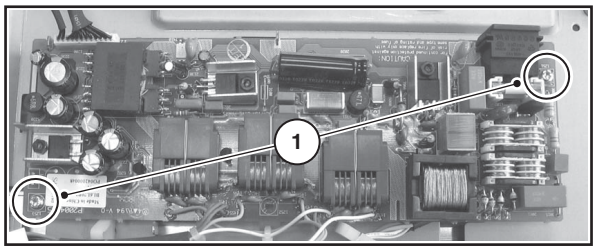


E_14520_035.eps
160904

Figure 4-3 Rear cover removal

1. Make sure all power-, audio-, video- and coax- cables are unplugged.
2. Remove all Torx screws (1) around the edges of the rear cover.
3. Remove the rear cover and store it in a safe place.

4.3 Power Supply Unit Removal

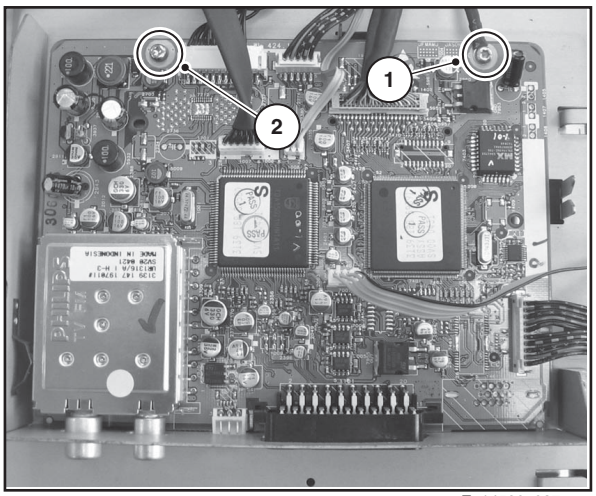


E_14520_036.eps
160904

Figure 4-4 Power supply unit

1. Disconnect all cables from the Power supply unit.
2. Remove all mounting screws (1) from the Power supply unit.
3. Take out the Power supply unit.

4.4 TV & Scaler Board Removal

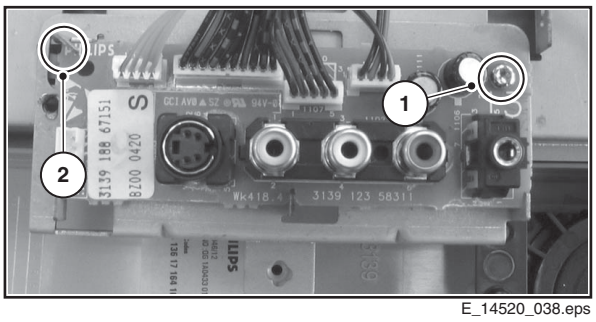


E_14520_037.eps
160904

Figure 4-5 TV & Scaler board removal

1. Disconnect all cables from the TV & Scaler board.
2. Remove the screw from the grounding cable (1).
3. Remove the mounting screw (2) and remove the board.

4.5 Side I/O Panel Removal



E_14520_038.eps
160904

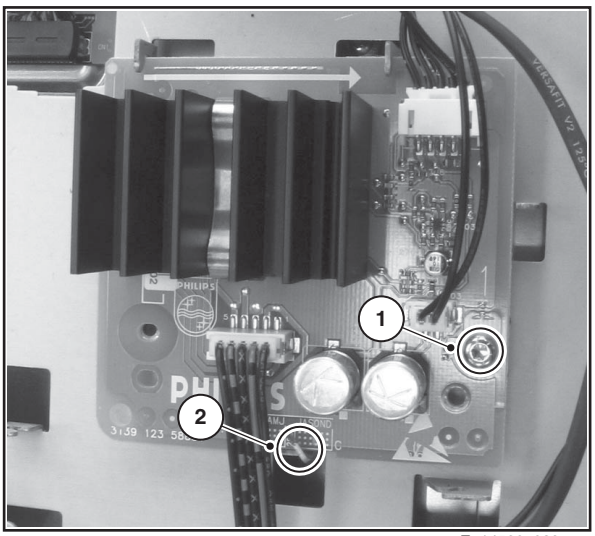
Figure 4-6 Side I/O panel removal

1. Disconnect all cables from the Side I/O panel.
2. Remove the mounting screw (1).
3. Unlock the panel by twisting back the clamp at the bottom (2).
4. Take out the Side I/O panel from the bracket.

4.6 Top Control Panel Removal

1. Disconnect the cable from the top control panel.
2. Remove the two mounting screws from the top control panel.
3. Take out the top control panel.

4.7 Audio Amplifier Panel Removal

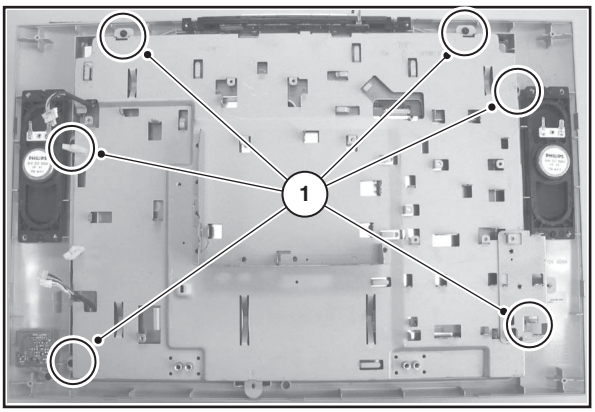


E_14520_039.eps
160904

Figure 4-7 Audio amplifier panel removal

1. Disconnect all cables from the audio amplifier panel.
2. Remove all mounting screws from the audio amplifier panel (1).
3. Unlock the panel by twisting back the clamp at the bottom (2).
4. Take out the audio amplifier panel.

4.8 Exchanging the LCD Panel



E_14520_040.eps
160904

Figure 4-8 Exchanging the LCD panel

1. Disconnect all cables from the LCD Panel.
2. Remove all mounting screws (1) from the metal cover.
3. Lift and take off the metal cover.
4. Now you can exchange the LCD panel.

4.9 Re-Assembly

To re-assemble the whole set, do all processes in reverse order.

Notes:
Do **not** forget to replace the ground cable of the TV & Scaler board, while mounting the screw at the board topside. See figure “TV & Scaler board removal”.

5. Service Modes, Error Codes, and Fault Finding

Index of this chapter:
1. Test Points
2. Service Modes
3. Problems and Solving Tips (related to CSM)
4. ComPair
5. Error Codes
6. The Blinking LED Procedure
7. Fault Finding and Repair Tips

5.1 Test Points

This chassis is equipped with test points in the service printing. In the schematics test points are identified with a rectangle box around Fxxx or Ixxx. These test points are specifically mentioned in the service manual as “half moons” with a dot in the centre.
Perform measurements under the following conditions:
- Television set in Service Default Alignment Mode.
- Video input: Colour bar signal.
- Audio input: 3 kHz left channel, 1 kHz right channel.

5.2 Service Modes

Service Default mode (SDM) and Service Alignment Mode (SAM) offers several features for the service technician, while the Customer Service Mode (CSM) is used for communication between the call centre and the customer.

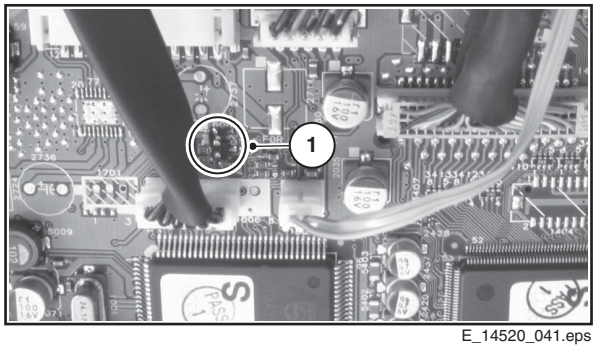
This chassis also offers the option of using ComPair, a hardware interface between a computer and the TV chassis. It offers the abilities of structured troubleshooting, error code reading, and software version readout for all chassis.
Minimum requirements for ComPair: a Pentium processor, a Windows OS, and a CD-ROM drive (see also paragraph "ComPair").

5.2.1 Service Default Mode (SDM)

Purpose
- To create a predefined setting for measurements to be made.
- To override software protections.
- To start the blinking LED procedure.
- To inspect the error buffer.
- To check the life timer.

Specifications
- Tuning frequency: 475.25 MHz.
- Colour system: PAL-BG.
- All picture settings at 50% (brightness, colour contrast, hue).
- Bass, treble and balance at 50 %; volume at 25 %.
- All service-unfriendly modes (if present) are disabled. The service unfriendly modes are:
  - Timer / Sleep timer.
  - Child / parental lock.
  - Blue mute.
  - Hotel / hospital mode.
  - Auto shut off (when no “IDENT” video signal is received for 15 minutes).
  - Skipping of non-favourite presets / channels.
  - Auto-storage of personal presets.
  - Auto user menu time-out.
  - Auto Volume Levelling (AVL).

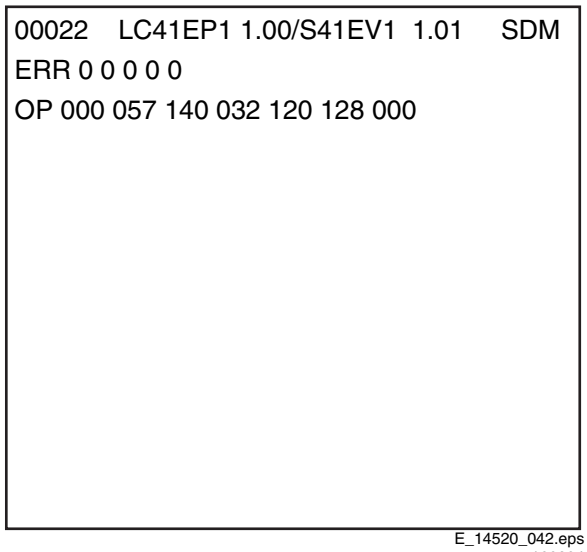
How to enter
To enter SDM, use one of the following methods:
- Press the following key sequence on the remote control transmitter: “062596” directly followed by the MENU button (do not allow the display to time out between entries while keying the sequence).
- Short "Service" jumpers on the TV board during cold start and apply mains (see Figure "Service jumpers"). Then press the mains button (remove the short after start-up). **Caution**: Entering SDM by shorting "Service" jumpers will override the +5V-protection. Do this only for a short period. When doing this, the service-technician must know exactly what he is doing, as it could damage the television set.
- Or via ComPair.



E_14520_041.eps
160904

Figure 5-1 Service jumpers

After entering SDM, the following screen is visible, with SDM in the upper right corner of the screen to indicate that the television is in Service Default Alignment Mode.



E_14520_042.eps
160904

Figure 5-2 SDM menu

How to navigate
Use one of the following methods:
- When you press the MENU button on the remote control, the set will switch on the normal user menu in the SDM mode.
- On the TV, press and hold the VOLUME DOWN and press the CHANNEL DOWN for a few seconds, to switch from SDM to SAM and reverse.

How to exit

Switch the set to STANDBY by pressing the mains button on the remote control transmitter or the television set.
If you turn the television set off by removing the mains (i.e., unplugging the television) without using the mains button, the television set will remain in SDM when mains is re-applied, and the error buffer is not cleared.

5.2.2 Service Alignment Mode (SAM)

Purpose

- To change option settings.
- To display / clear the error code buffer.
- To perform alignments.

Specifications

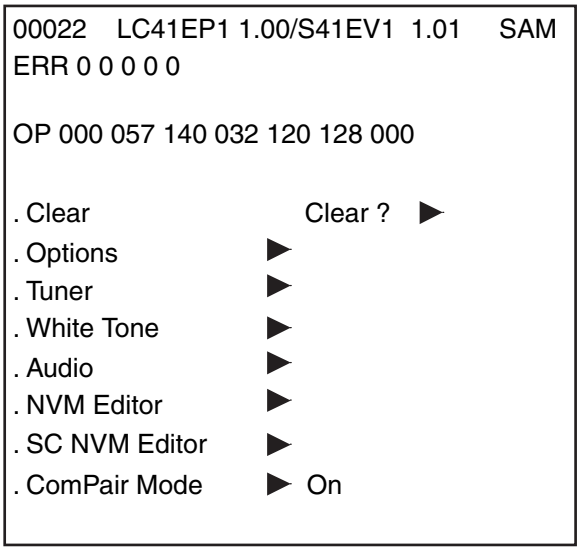
- Operation hours counter (maximum five digits displayed).
- Software version, Error codes, and Option settings display.
- Error buffer clearing.
- Option settings.
- AKB switching.
- Software alignments (Tuner, White Tone, Geometry & Audio).
- NVM Editor.
- ComPair Mode switching.

How to enter

To enter SAM, use one of the following methods:

- Press the following key sequence on the remote control transmitter: "**062596**" directly followed by the **OSD/ STATUS** button (do not allow the display to time out between entries while keying the sequence).
- Or via ComPair.

After entering SAM, the following screen is visible, with SAM in the upper right corner of the screen to indicate that the television is in Service Alignment Mode.


00022 LC41EP1 1.00/S41EV1 1.01 SAM
ERR 0 0 0 0 0
OP 000 057 140 032 120 128 000
. Clear Clear ? ▶
. Options ▶
. Tuner ▶
. White Tone ▶
. Audio ▶
. NVM Editor ▶
. SC NVM Editor ▶
. ComPair Mode ▶ On

E_14520_043.eps
160904

Figure 5-3 SAM menu

Menu explanation

1. **LLLLL.** This represents the run timer. The run timer counts normal operation hours, but does not count standby hours.
2. **AAABCD-X.Y.** This is the software identification of the main microprocessor:
   - **A**= the project name (LC41).
   - **B**= the region: E= Europe, A= Asia Pacific, U= NAFTA, L= LATAM.
   - **C**= the software diversity:
     - **Europe:** T= 1 page TXT, F= Full TXT, V= Voice control.
     - **LATAM and NAFTA:** N= Stereo non-dBx, S= Stereo dBx.
     - **Asian Pacific:** T= TXT, N= non-TXT, C= NTSC.
     - **ALL regions:** M= mono, D= DVD, Q= Mk2.
   - **D**= the language cluster number.
   - **X**= the main software version number (updated with a major change that is incompatible with previous versions).
   - **Y**= the sub software version number (updated with a minor change that is compatible with previous versions).
   - **EEEEEE**= the scaler sw cluster
   - **F**= the main sw version no.
   - **GG**= the sub-version no.
3. **SAM.** Indication of the Service Alignment Mode.
4. **Error Buffer.** Shows all errors detected since the last time the buffer was erased. Five errors possible.
5. **Option Bytes.** Used to set the option bytes. See "Options" in the Alignments section for a detailed description. Seven codes are possible.
6. **Clear.** Erases the contents of the error buffer. Select the CLEAR menu item and press the MENU RIGHT key. The content of the error buffer is cleared.
7. **Options.** Used to set the option bits. See "Options" in the Alignments section for a detailed description.
8. **Tuner.** Used to align the tuner. See "Tuner" in the Alignments section for a detailed description.
9. **White Tone.** Used to align the white tone. See "White Tone" in the Alignments section for a detailed description.
10. **Audio.** No audio alignment is necessary for this television set.
11. **NVM Editor.** Can be used to change the NVM data in the television set. See table "NVM data" further on.
12. **SC NVM Editor.** Can be used to edit Scaler NVM.
13. **ComPalr.** Can be used to switch on the television to In System Programming (ISP) mode, for software uploading via ComPair.
    Caution: When this mode is selected without ComPair connected, the TV will be blocked. Remove the AC power to reset the TV.

How to navigate

- In SAM, select menu items with the MENU UP/DOWN keys on the remote control transmitter. The selected item will be highlighted. When not all menu items fit on the screen, use the MENU UP/DOWN keys to display the next / previous menu items.
- With the MENU LEFT/RIGHT keys, it is possible to:
  - Activate the selected menu item.
  - Change the value of the selected menu item.
  - Activate the selected submenu.
- In SAM, when you press the MENU button twice, the set will switch to the normal user menus (with the SAM mode still active in the background). To return to the SAM menu press the MENU or STATUS/EXIT button.
- When you press the MENU key in while in a submenu, you will return to the previous menu.

How to store SAM settings

To store the settings changed in SAM mode, leave the top level SAM menu by using the POWER button on the remote control transmitter or the television set.

How to exit

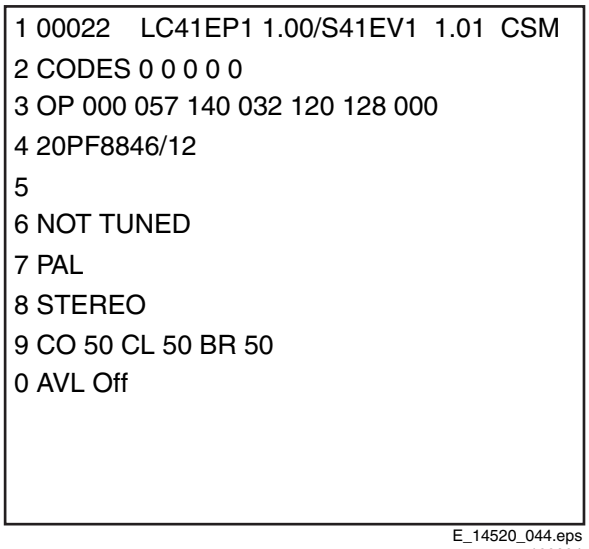
Switch the set to STANDBY by pressing the mains button on the remote control transmitter or the television set.
If you turn the television set "off" by removing the mains (i.e., unplugging the television) without using the mains button, the television set will remain in SAM when mains is re-applied, and the error buffer is not cleared.

5.2.3 Customer Service Mode (CSM)

Purpose
The Customer Service Mode shows error codes and information on the TV's operation settings. The call centre can instruct the customer (by telephone) to enter CSM in order to identify the status of the set. This helps the call centre to diagnose problems and failures in the TV set before making a service call.
The CSM is a read-only mode; therefore, modifications are not possible in this mode.

How to enter
To enter CSM, press the following key sequence on the remote control transmitter: "**123654**" (do not allow the display to time out between entries while keying the sequence).

Upon entering the Customer Service Mode, the following screen will appear:



E_14520_044.eps
160904

Figure 5-4 CSM menu

Menu explanation
1. Indication of the decimal value of the operation hours counter, Software identification of the main microprocessor (see "Service Default or Alignment Mode" for an explanation), and the service mode (CSM= Customer Service Mode).
2. Displays the last five errors detected in the error code buffer.
3. Displays the option bytes.
4. Displays the type number version of the set.
5. Reserved item for P3C call centres (AKBS stands for Advanced Knowledge Base System).
6. Indicates the television is receiving an "IDENT" signal on the selected source. If no "IDENT" signal is detected, the display will read "NOT TUNED"
7. Displays the detected Colour system (e.g. PAL/NTSC).
8. Displays the detected Audio (e.g. stereo/mono).
9. Displays the picture setting information.
10. Displays the sound setting information.

How to exit
To exit CSM, use one of the following methods:
- Press the MENU, STATUS/EXIT, or POWER button on the remote control transmitter.
- Press the POWER button on the television set.

5.3 Problems and Solving Tips Related to CSM

5.3.1 Picture Problems

Note: The problems described below are all related to the TV settings. The procedures used to change the value (or status) of the different settings are described.

Picture too dark or too bright

If:
- The picture improves when you press the AUTO PICTURE button on the remote control transmitter, or
- The picture improves when you enter the Customer Service Mode,

Then:
1. Press the AUTO PICTURE button on the remote control transmitter repeatedly (if necessary) to choose PERSONAL picture mode.
2. Press the MENU button on the remote control transmitter. This brings up the normal user menu.
3. In the normal user menu, use the MENU UP/DOWN keys to highlight the PICTURE sub menu.
4. Press the MENU LEFT/RIGHT keys to enter the PICTURE sub menu.
5. Use the MENU UP/DOWN keys (if necessary) to select BRIGHTNESS.
6. Press the MENU LEFT/RIGHT keys to increase or decrease the BRIGHTNESS value.
7. Use the MENU UP/DOWN keys to select PICTURE.
8. Press the MENU LEFT/RIGHT keys to increase or decrease the PICTURE value.
9. Press the MENU button on the remote control transmitter twice to exit the user menu.
10. The new PERSONAL preference values are automatically stored.

White line around picture elements and text

If:
The picture improves after you have pressed the AUTO PICTURE button on the remote control transmitter,

Then:
1. Press the AUTO PICTURE button on the remote control transmitter repeatedly (if necessary) to choose PERSONAL picture mode.
2. Press the MENU button on the remote control transmitter. This brings up the normal user menu.
3. In the normal user menu, use the MENU UP/DOWN keys to highlight the PICTURE sub menu.
4. Press the MENU LEFT/RIGHT keys to enter the PICTURE sub menu.
5. Use the MENU UP/DOWN keys to select SHARPNESS.
6. Press the MENU LEFT key to decrease the SHARPNESS value.
7. Press the MENU button on the remote control transmitter twice to exit the user menu.
8. The new PERSONAL preference value is automatically stored.

Snowy picture
Check CSM line 6. If this line reads "Not Tuned", check the following:
- Antenna not connected. Connect the antenna.
- No antenna signal or bad antenna signal. Connect a proper antenna signal.
- The tuner is faulty (in this case line 2, the Error Buffer line, will contain error number 10). Check the tuner and replace/ repair the tuner if necessary.

Black and white picture

If:
- The picture improves after you have pressed the AUTO PICTURE button on the remote control transmitter,

Then:
1. Press the AUTO PICTURE button on the remote control transmitter repeatedly (if necessary) to choose PERSONAL picture mode.
2. Press the MENU button on the remote control transmitter. This brings up the normal user menu.
3. In the normal user menu, use the MENU UP/DOWN keys to highlight the PICTURE sub menu.
4. Press the MENU LEFT/RIGHT keys to enter the PICTURE sub menu.
5. Use the MENU UP/DOWN keys to select COLOUR.
6. Press the MENU RIGHT key to increase the COLOUR value.
7. Press the MENU button on the remote control transmitter twice to exit the user menu.
8. The new PERSONAL preference value is automatically stored.

Menu text not sharp enough

If:
- The picture improves after you have pressed the AUTO PICTURE button on the remote control transmitter,

Then:
1. Press the AUTO PICTURE button on the remote control transmitter repeatedly (if necessary) to choose PERSONAL picture mode.
2. Press the MENU button on the remote control transmitter. This brings up the normal user menu.
3. In the normal user menu, use the MENU UP/DOWN keys to highlight the PICTURE sub menu.
4. Press the MENU LEFT/RIGHT keys to enter the PICTURE sub menu.
5. Use the MENU UP/DOWN keys to select PICTURE.
6. Press the MENU LEFT key to decrease the PICTURE value.
7. Press the MENU button on the remote control transmitter twice to exit the user menu.
8. The new PERSONAL preference value is automatically stored.

5.4 ComPair

Note: Make sure that both the ComPair connector and the UART connector are shielded off with a piece of insulating tape after repair for ESD reasons. Place this tape over the holes in the rear cover of the set.

5.4.1 Introduction

ComPair (Computer Aided Repair) is a service tool for Philips Consumer Electronics products. ComPair is a further development on the European DST (service remote control), which allows faster and more accurate diagnostics. ComPair has three big advantages:
- ComPair helps you to quickly get an understanding on how to repair the chassis in a short time by guiding you systematically through the repair procedures.
- ComPair allows very detailed diagnostics (on I^2C level) and is therefore capable of accurately indicating problem areas. You do not have to know anything about I^2C commands yourself because ComPair takes care of this.
- ComPair speeds up the repair time since it can automatically communicate with the chassis (when the microprocessor is working) and all repair information is directly available. When ComPair is installed together with the Force/SearchMan electronic manual of the defective chassis, schematics and PWBs are only a mouse click away.

5.4.2 Specifications

ComPair consists of a Windows based fault finding program and an interface box between PC and the (defective) product. The ComPair interface box is connected to the PC via a serial (or RS232) cable.
For this chassis, the ComPair interface box and the TV communicate via a bi-directional service cable via the service connector(s).

The ComPair fault finding program is able to determine the problem of the defective television. ComPair can gather diagnostic information in two ways:
- Automatic (by communication with the television): ComPair can automatically read out the contents of the entire error buffer. Diagnosis is done on I^2C/UART level. ComPair can access the I^2C/UART bus of the television. ComPair can send and receive I^2C/UART commands to the micro controller of the television. In this way, it is possible for ComPair to communicate (read and write) to devices on the I^2C/UART buses of the TV-set.
- Manually (by asking questions to you): Automatic diagnosis is only possible if the micro controller of the television is working correctly and only to a certain extend. When this is not the case, ComPair will guide you through the fault finding tree by asking you questions (e.g. *Does the screen give a picture? Click on the correct answer: YES / NO*) and showing you examples (e.g. *Measure test-point I7 and click on the correct oscillogram you see on the oscilloscope*). You can answer by clicking on a link (e.g. text or a waveform picture) that will bring you to the next step in the fault finding process.

By a combination of automatic diagnostics and an interactive question / answer procedure, ComPair will enable you to find most problems in a fast and effective way.

Beside fault finding, ComPair provides some **additional features** like:
- Up- or downloading of pre-sets.
- Managing of pre-set lists.
- Emulation of the (European) Dealer Service Tool (DST).
- If both ComPair and Force/SearchMan (Electronic Service Manual) are installed, all the schematics and the PWBs of the set are available by clicking on the appropriate hyperlink.
  Example: *Measure the DC-voltage on capacitor C2568 (Schematic/Panel) at the Mono-carrier.*
  – Click on the “Panel” hyperlink to automatically show the PWB with a highlighted capacitor C2568.
  – Click on the “Schematic” hyperlink to automatically show the position of the highlighted capacitor.

5.4.3 How To Connect

1. First, install the ComPair Browser software (see the Quick Reference Card for installation instructions).
2. Connect the RS232 interface cable between a free serial (COM) port of your PC and the PC connector (marked with “PC”) of the ComPair interface.
3. Connect the mains adapter to the supply connector (marked with “POWER 9V DC”) of the ComPair interface.
4. Switch the ComPair interface “OFF”.
5. Switch the television set “OFF” with the POWER switch.
6. Connect the ComPair I^2C/UART interface cable between the connector on the rear side of the ComPair interface (marked with “I^2C” or for UART on the connector marked “VCR”) and the appropriate ComPair connector at the rear side of the TV (I^2C or UART).
   Note: Some chassis need an additional I^2C extension cable due to a different connector pitch!

7. Plug the mains adapter in a mains outlet, and switch the interface “ON”. The green and red LEDs light up together. The red LED extinguishes after approx. 1 second while the green LED remains lit.
8. Start the ComPair program and read the “Introduction” chapter.

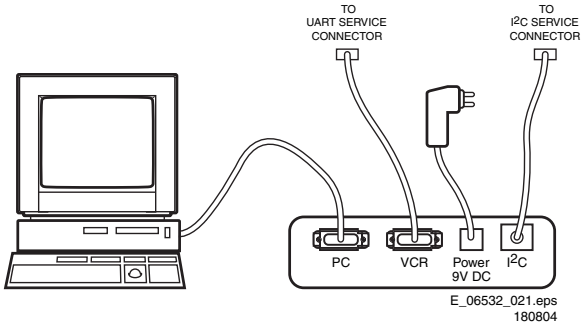


Figure 5-5 ComPair Interface connection

5.4.4 How To Order

ComPair order codes (EU/AP/LATAM):
- Starter kit ComPair32/SearchMan32 software and ComPair interface (excl. transformer): 3122 785 90450.
- ComPair interface (excluding transformer): 4822 727 21631.
- Starter kit ComPair32 software (registration version): 3122 785 60040.
- Starter kit SearchMan32 software: 3122 785 60050.
- ComPair32 CD (update): 3122 785 60070 (year 2002, 3122 785 60110 (year 2003).
- SearchMan32 CD (update): 3122 785 60080 (year 2002), 3122 785 60120 (year 2003), 3122 785 60130 (year 2004).
- ComPair I^2C interface cable: 3122 785 90004.
- ComPair firmware upgrade IC: 3122 785 90510.
- Transformer (non-UK): 4822 727 21632.
- Transformer (UK): 4822 727 21633.
- ComPair I^2C extension cable: 3139 131 03791.
- ComPair UART interface cable: 3122 785 90630.

Note: If you encounter any problems, contact your local support desk.

5.5 Error Codes

The error code buffer contains all errors detected since the last time the buffer was erased. The buffer is written from left to right. When an error occurs that is not yet in the error code buffer, it is displayed at the left side and all other errors shift one position to the right.

5.5.1 How To Read The Error Buffer

You can read the error buffer in 3 ways:
- On screen via the SAM (if you have a picture).
  Examples:
  - ERROR: 0 0 0 0 0 : No errors detected
  - ERROR: 6 0 0 0 0 : Error code 6 is the last and only detected error
  - ERROR: 9 6 0 0 0 : Error code 6 was detected first and error code 9 is the last detected (newest) error
- Via the blinking LED procedure (when you have no picture). See “The Blinking LED Procedure”.
- Via ComPair.

5.5.2 How To Clear The Error Buffer

The error code buffer is cleared in the following cases:
- By using the CLEAR command in the SAM menu:
  - To enter SAM, press the following key sequence on the remote control transmitter: “062596” directly followed by the OSD/STATUS button (do not allow the display to time out between entries while keying the sequence).
  - Make sure the menu item CLEAR is highlighted. Use the MENU UP/DOWN buttons, if necessary.
  - Press the MENU RIGHT button to clear the error buffer. The text on the right side of the “CLEAR” line will change from “CLEAR?” to “CLEARED”
- If the contents of the error buffer have not changed for 50 hours, the error buffer resets automatically.

Note: If you exit SAM by disconnecting the mains from the television set, the error buffer is not reset.

5.5.3 Error Codes

In case of non-intermittent faults, write down the errors present in the error buffer and clear the error buffer before you begin the repair. This ensures that old error codes are no longer present.
If possible, check the entire contents of the error buffer. In some situations, an error code is only the result of another error and not the actual cause of the problem (for example, a fault in the protection detection circuitry can also lead to a protection).

Table 5-1 Error code overview

Error	Device	Error description	Check item	Diagram
0	Not applicable	No Error		
1	Not applicable	-	-	-
2	Not applicable	-	-	-
3	Not applicable	-	-	-
4	GM5221	I2C error while communicating with the Genesis Scaler and/or Flash-ROM is faulty/ empty	7401 7403	A6
5	Not applicable	+5v protection	7930	A6
6	I2C bus	General I2C error	7011, 3083, 3084	A2
7	Not applicable	-	-	-
8	M24C32	I2C error while communicating with the Scaler EEPROM	7402	A7
9	M24C16	I2C error while communicating with the EEPROM	7099	A2
10	Tuner	I2C error while communicating with the PLL tuner	1302, 3302, 3303, 3327	A1
11	Not applicable	-	-	-
12	Not applicable	-	-	-
13	Not applicable	-	-	-

5.6 The Blinking LED Procedure

Using this procedure, you can make the contents of the error buffer visible via the front LED. This is especially useful when there is no picture.

When the SDM is entered, the front LED will blink the contents of the error-buffer:
- The Led blinks with as many pulses as the error code number, followed by a time period of 1.5 seconds, in which the Led is off.
- Then this sequence starts is repeated.

Any RC5 command terminates this sequence.

Example of error buffer: **12 9 6 0 0**
After entering SDM, the following occurs:
- 1 long blink of 5 seconds to start the sequence,
- 12 short blinks followed by a pause of 1.5 seconds,
- 9 short blinks followed by a pause of 1.5 seconds,
- 6 short blinks followed by a pause of 1.5 seconds,
- 1 long blink of 1.5 seconds to finish the sequence,
- The sequence starts again at 12 short blinks.

5.7 Fault Finding and Repair Tips

Notes:
- It is assumed that the components are mounted correctly with correct values and no bad solder joints.
- Before any fault finding actions, check if the correct options are set.

5.7.1 NVM Editor

In some cases, it can be handy if one directly can change the NVM contents. This can be done with the “NVM Editor” in SAM mode.

5.7.2 Tuner and IF

No Picture in RF mode
1. Check whether picture is present in AV. If not, go to Video processing troubleshooting section.
2. If present, check that the Option settings are correct.
3. Check that all supply voltages are present.
4. Check if I2C lines are working correctly (3.3V).
5. Manually store a known channel and check if there is IF output at Tuner pin 11.
6. Feed in 105 dBuV at Tuner pin 11 and check whether there is RGB output from Video Processing IC. If yes, Tuner may be defected. Change Tuner.

Sound in picture problem for L' system (rolling horizontal lines)
1. Check whether AGC L' in Sam mode is set to 0.
2. If yes, align the set to correct value.

Required system is not selected correctly
1. Check whether the Service jumper (#4022, 08 05 size) is present. If yes, remove it.
2. Check whether SEL_IF pin is according to what is specified.

5.7.3 Video Processing

No power
1. Check +12 V and 3V3 at position 1910.
2. If no supply, check the connector 1910.
3. If it is correct, check the power supply board.

Power supply is correct but no green light
1. Check the two connectors 1007 and 1008, if they are properly inserted.
2. If they are inserted correctly, check if the 3V3 is present.

No picture display
1. Check the RGB signal.
2. If it is present, check pin 3 of IC7006 (NE555).
3. If it has output, the problem is in SCALER part.
4. Otherwise, check H-out on pin 2 of NE555. If the input signal of pin2 is present, but no output, the IC is failed.

Note:
- If the H-out (pin 67) doesn’t have signal or the level is low, check the output of NE555 (pin 3) during start up.
- If the H-out (pin 67) has a signal (or has a signal for a very short time), change IC7006 (NE555).

No TV but PC is present
1. Check if HSYNC and VSYNC are present at PIN 3 of 7007 and 7005.
2. If they are present, check RGB output.
3. If there is no RGB output, the IC TDA120xx can be failed.

Comb Filter not working
1. Check the option bit 5 in SAM.

5.7.4 Power Supply

Check fuses
This power supply contains three fuses. One is near the mains inlet (marked on the board as 1102) and two other are near the output connectors (marked 1610 and 1660).

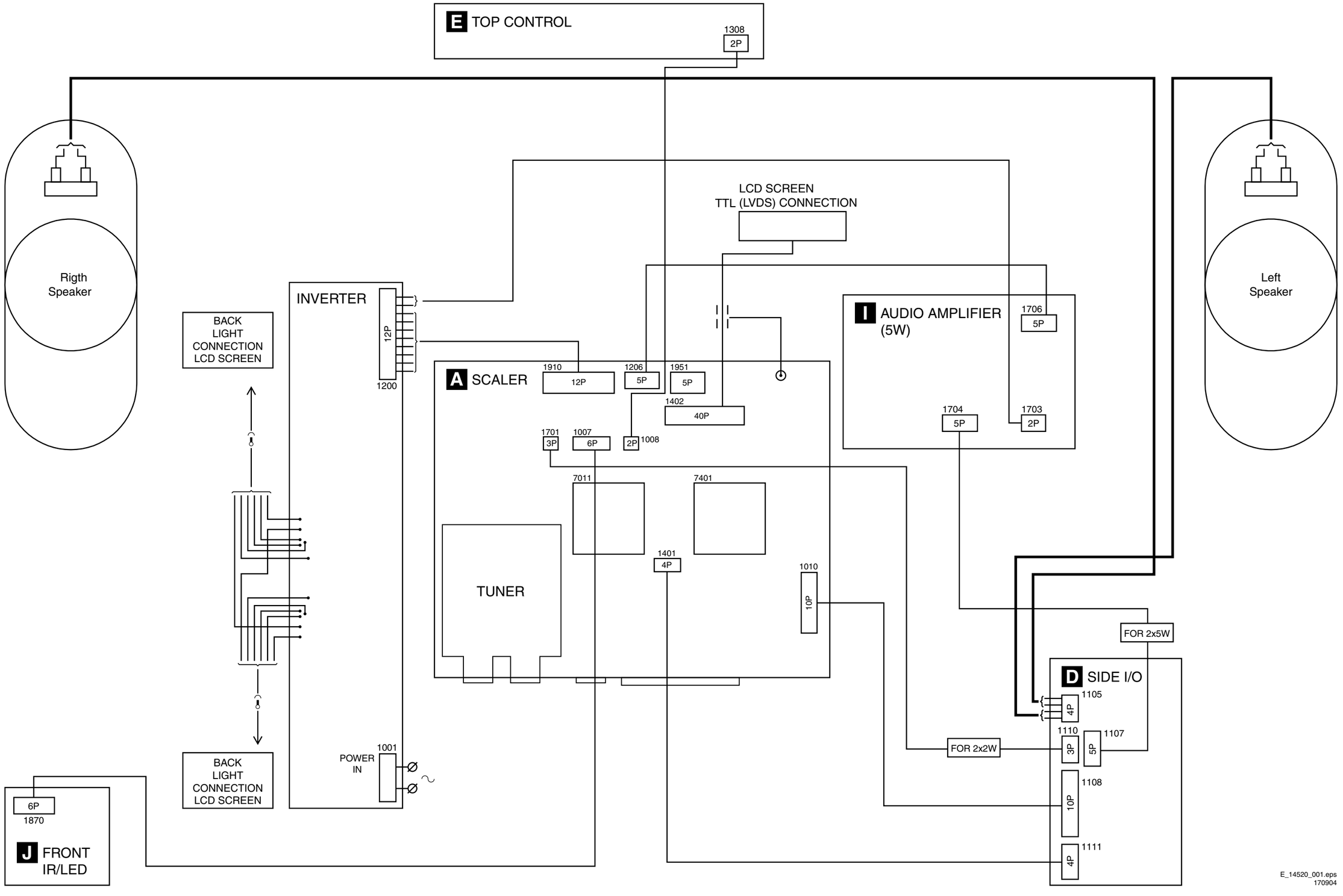
1. Check with power supply in off state by means of ohmic measurement.
2. Fuse 1102 may open in case of severe lightning strikes and/or failures in the power supply. Despite the fact, that this fuse is mounted in a fuse holder and the marking text on the board, it is not meant to be field replaceable.
3. Fuses 1610 and 1660 may open in case a severe overload of the 12 V outputs. Replacement of the power supply is needed, but not before the cause of the overload conditions is resolved.

Standby mode
1. Apply a 12 ohm load resistor of sufficient power rating to all outputs (+3 V3, +12 VAL, +12 VL and +24 V). Connect the STBY pin to GND.
2. Over an input voltage range of 90 V_ac to 264 V_ac only the +3 V3 output shall be up and within regulation (±5%). The voltage on the POWER DOWN pin shall be < 0.3 V at an input voltage below 160 V_ac, and 3.3 V ±10% at an input voltage higher than 240 V_ac.

Normal mode:
1. Apply a 12 ohm load resistor of sufficient power rating to all outputs (+3 V3, +12 VAL, +12 VL and +24 V). Connect the STBY pin to the +3 V3 output.
2. Over an input voltage range of 90 V _ac to 264 V_ac all outputs shall be up and within regulation (±5%). The voltage on the POWER DOWN pin shall be 3.3 V ±10% over the entire input voltage range. Additionally, the voltage on the big capacitor mounted flat on the PCB shall be 400 V ±10%

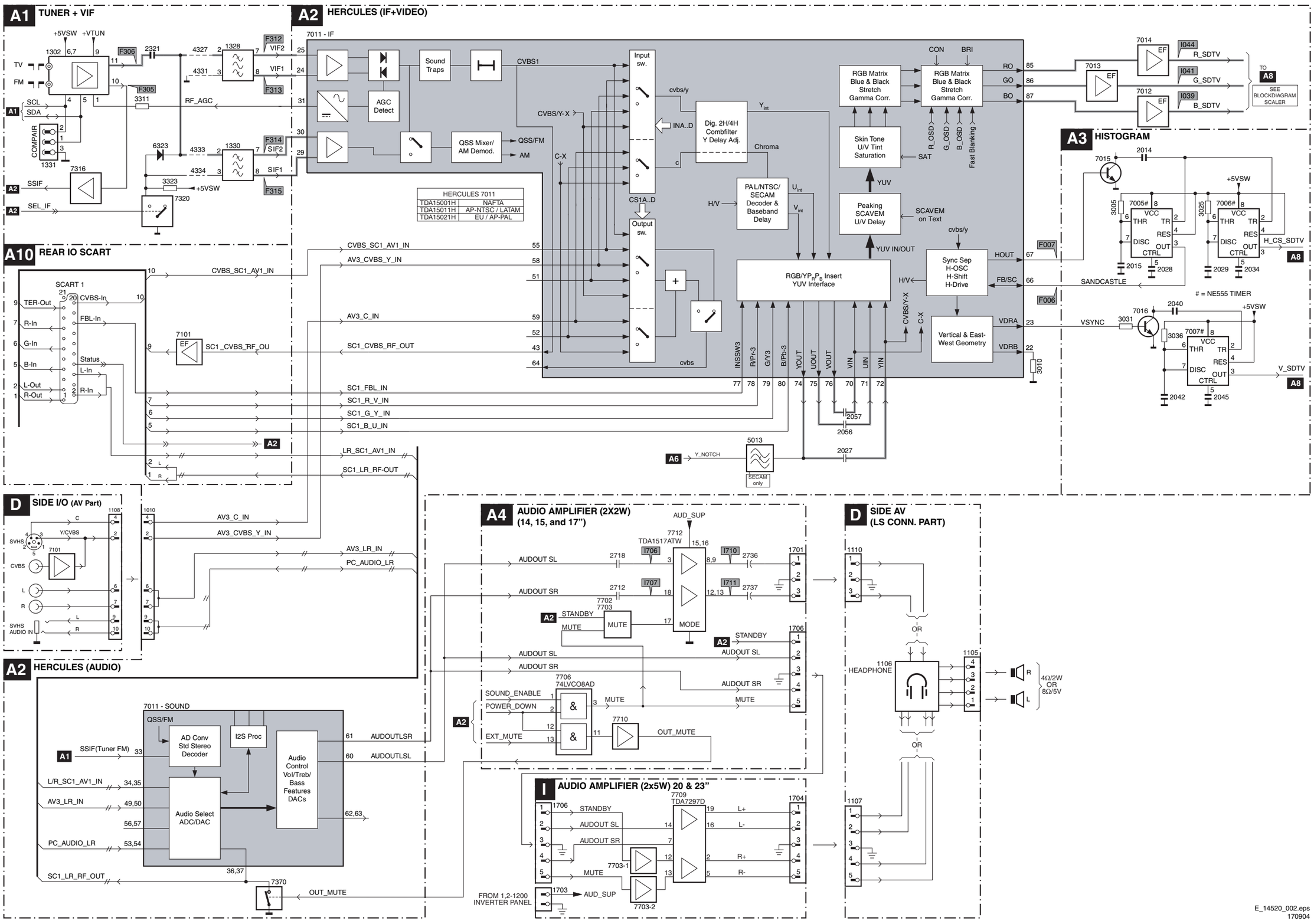
6. Block Diagrams, Testpoint Overviews, and Waveforms

Wiring Diagram

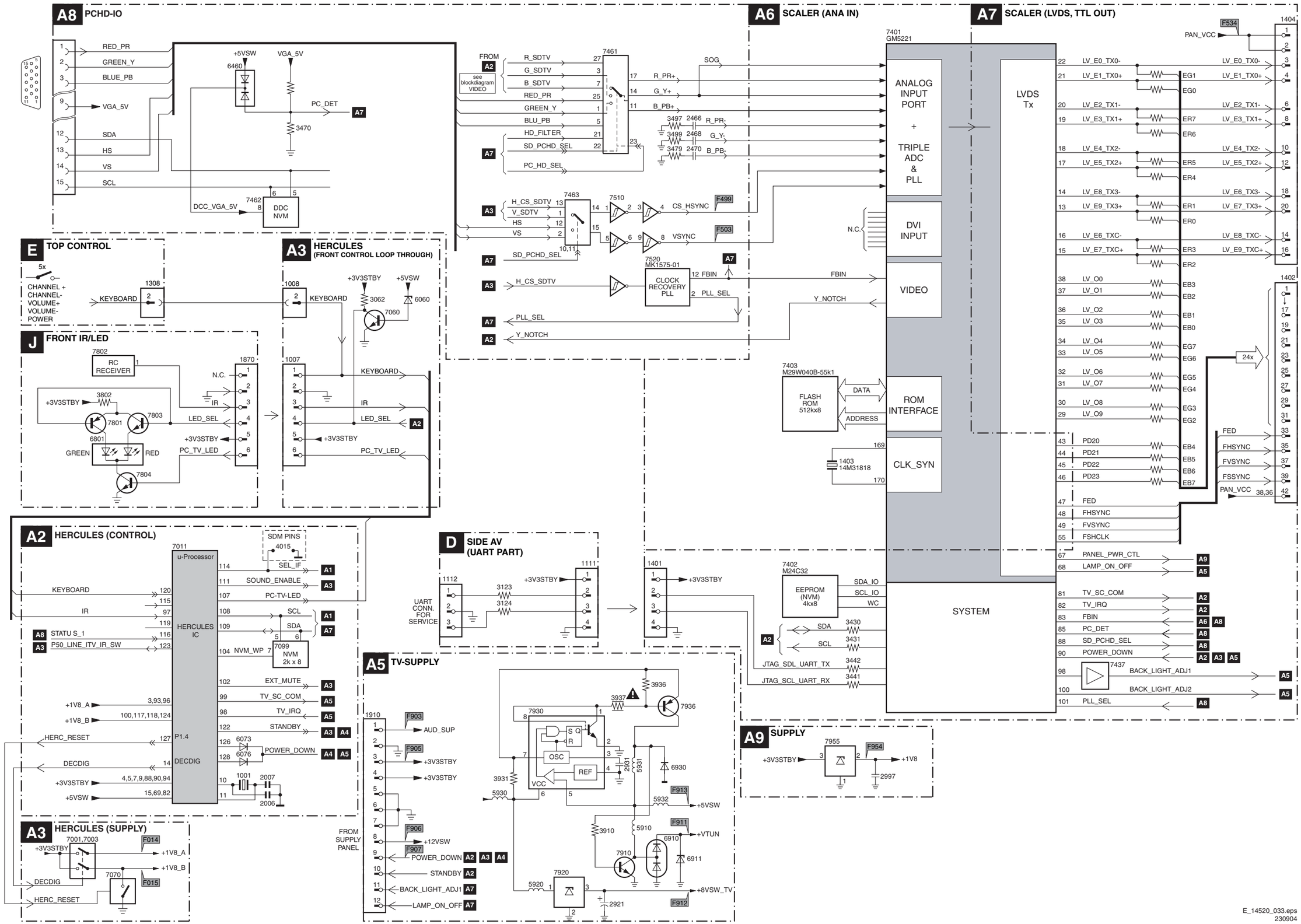


E_14520_001.eps
170904

Block Diagram Audio & Video

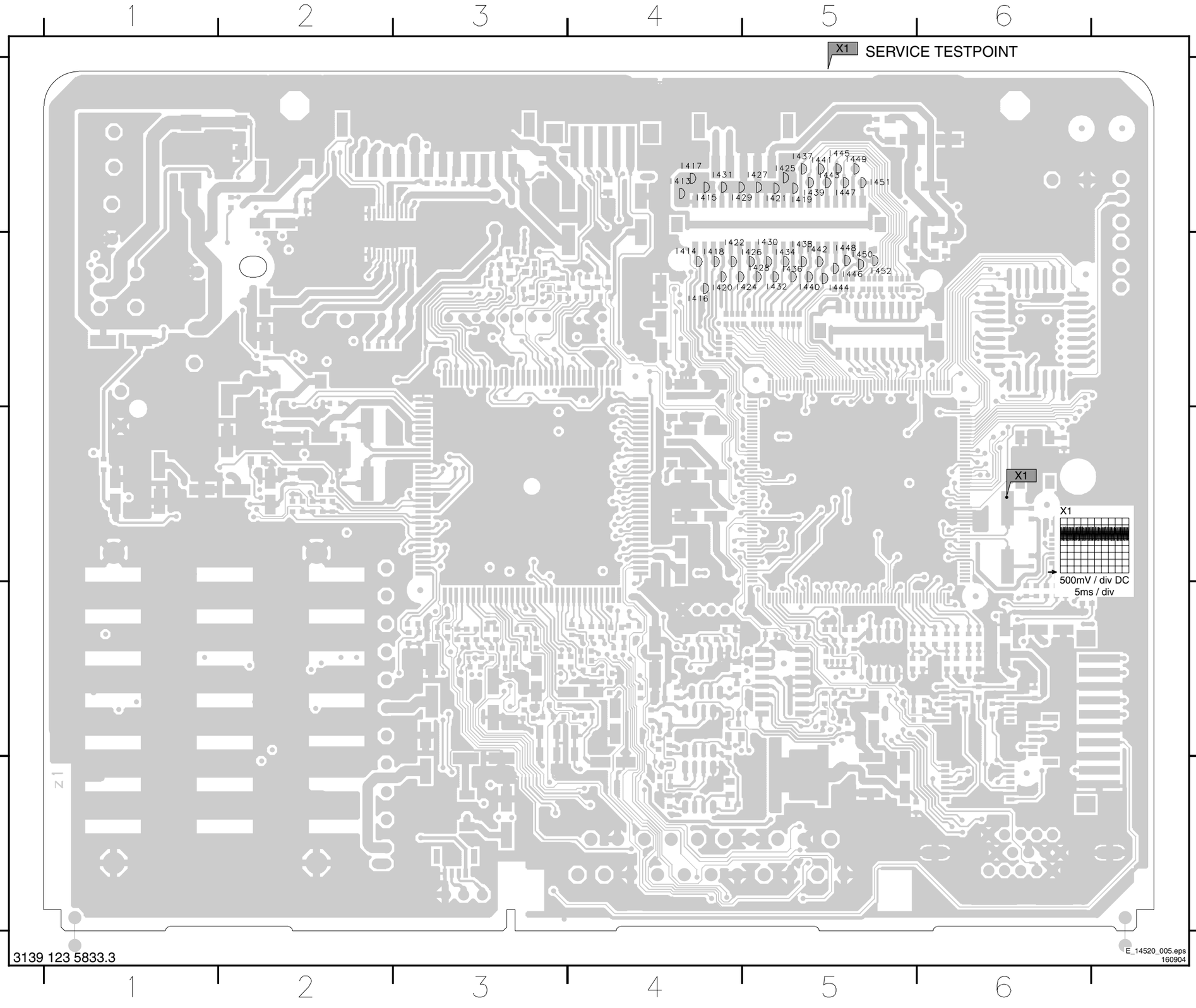


Block Diagram Scaler & Supply



E_14520_033.eps
230904

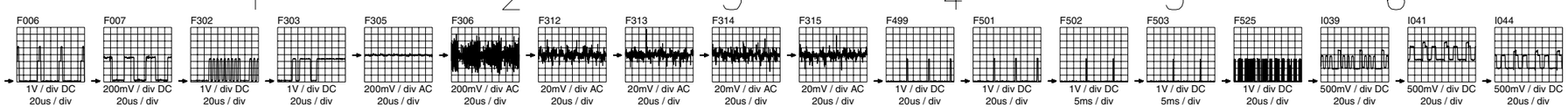
Testpoint Overview TV & Scaler Board (Top Side)



I413 A4
I414 B4
I415 A4
I416 B4
I417 A4
I418 B4
I419 A5
I420 B4
I421 A5
I422 B4
I424 B5
I425 A5
I426 B5
I427 A5
I428 B5
I429 A4
I430 B5
I431 A4
I432 B5
I434 B5
I436 B5
I437 A5
I438 B5
I439 A5
I440 B5
I441 A5
I442 B5
I443 A5
I444 B5
I445 A5
I446 B5
I447 A5
I448 B5
I449 A5
I450 B5
I451 A5
I452 B5

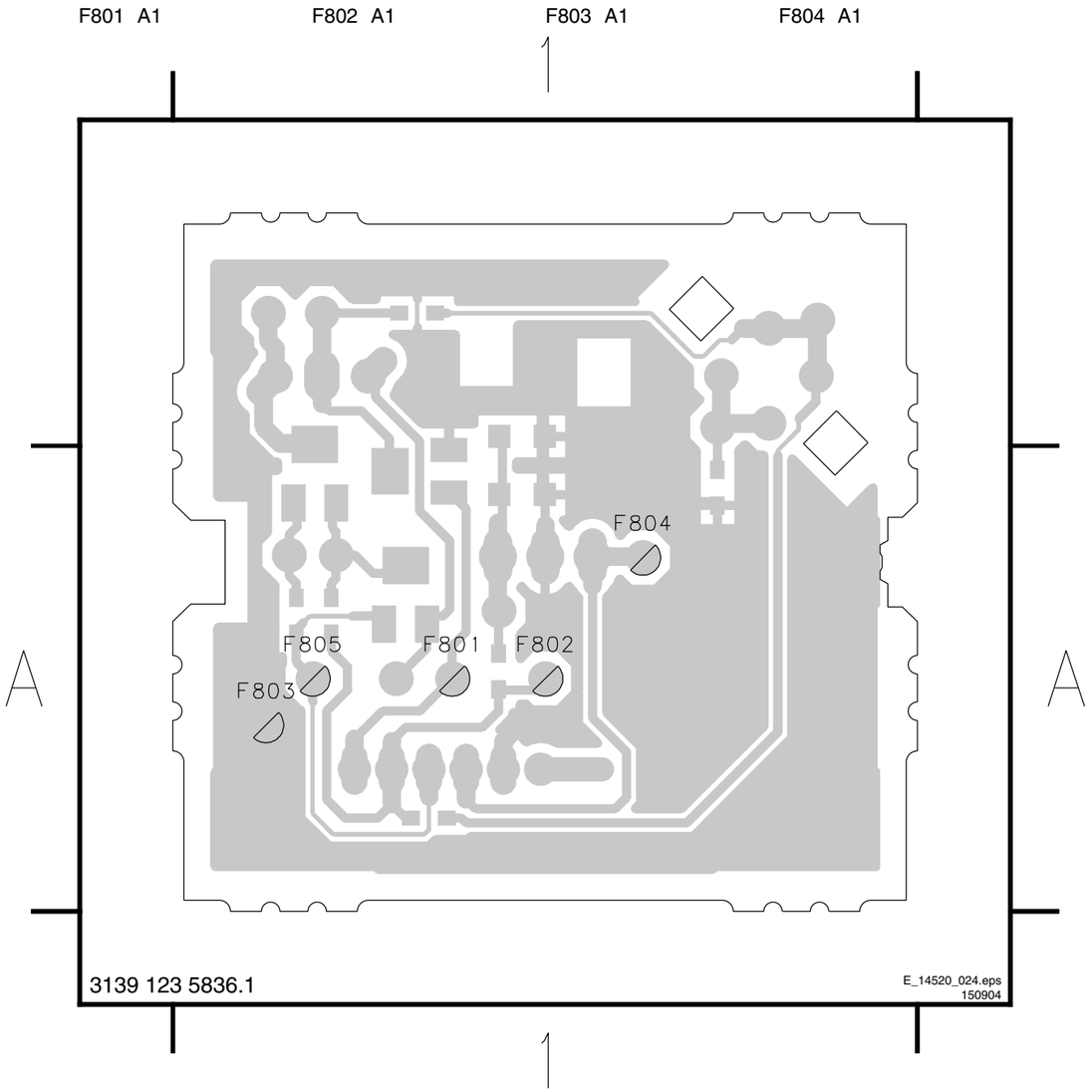
Testpoint Overview TV & Scaler Board (Bottom Side)

F014 = 1V8 DC
F015 = 1V8 DC
F404 = 3V3 DC
F405 = 1V8 DC
F406 = 1V8 DC
F407 = 3V3 DC
F903 = 0V DC
F905 = 3V3 DC
F906 = 14V3 DC
F907 = 3V3 DC
F911 = 33V DC
F912 = 8V1 DC
F913 = 5V4 DC
F951 = 12V DC
F954 = 1V8 DC


F006 1V / div DC 20us / div
F007 200mV / div DC 20us / div
F302 1V / div DC 20us / div
F303 1V / div DC 20us / div
F305 200mV / div AC 20us / div
F306 200mV / div AC 20us / div
F312 20mV / div AC 20us / div
F313 20mV / div AC 20us / div
F314 20mV / div AC 20us / div
F315 20mV / div AC 20us / div
F499 1V / div DC 20us / div
F501 1V / div DC 20us / div
F502 1V / div DC 5ms / div
F503 1V / div DC 5ms / div
F525 1V / div DC 20us / div
I039 500mV / div DC 20us / div
I041 500mV / div DC 20us / div
I044 500mV / div DC 20us / div

F002	C4	F487	D2	I041	D3	I467	D2
F003	D6	F488	D2	I042	D3	I470	D1
F004	B4	F489	D1	I043	D3	I471	D1
F005	D3	F490	D1	I044	D3	I472	D2
F006	D3	F491	D1	I045	D3	I473	D1
F007	D3	F492	D1	I046	C3	I474	D1
F008	D3	F493	D1	I047	C3	I475	D1
F009	B4	F494	D1	I048	C3	I476	D1
F010	D3	F495	D2	I049	C3	I477	D1
F013	B4	F496	D1	I050	C3	I478	D2
F014	C5	F497	C2	I051	C3	I479	D1
F015	C6	F498	D2	I052	C3	I480	E1
F017	D5	F499	C1	I053	C3	I481	D1
F018	B4	F501	D2	I054	C3	I482	E1
F020	B4	F502	D2	I055	B3	I483	E1
F021	B4	F503	C1	I056	B4	I484	D1
F022	C4	F520	C2	I057	D3	I485	E1
F023	D6	F521	C2	I058	B3	I486	D2
F026	B3	F525	B1	I059	B4	I487	D2
F029	C3	F526	B2	I060	B3	I492	D1
F030	E4	F527	B2	I061	B3	I493	C1
F031	E4	F528	B2	I062	B4	I494	C1
F032	E4	F529	B2	I063	B4	I496	C1
F033	E4	F530	B2	I064	B4	I510	C1
F034	E4	F531	B2	I065	D4	I511	C1
F050	B4	F532	B2	I066	D3	I512	E1
F051	B4	F533	B1	I067	B4	I513	E1
F099	A4	F534	B2	I068	B4	I514	D1
F101	E3	F535	B2	I069	D3	I515	A2
F102	E3	F536	B2	I070	B4	I516	D2
F103	E3	F701	D6	I071	B4	I517	D2
F104	E2	F702	D6	I072	C4	I518	D2
F105	E3	F707	B5	I073	C5	I519	C1
F106	E3	F708	A5	I082	B5	I520	D1
F107	E3	F709	E6	I091	B3	I701	A5
F108	E3	F710	A4	I093	C5	I705	D6
F109	E2	F902	A4	I094	C4	I706	B5
F110	E2	F903	A4	I095	B4	I707	A5
F111	E2	F904	A4	I096	C5	I708	A5
F112	E2	F905	A4	I097	D3	I709	B5
F113	E2	F906	A6	I098	B4	I710	B5
F114	E3	F907	A4	I099	B4	I711	A4
F115	E3	F908	A5	I101	E3	I714	D6
F116	E2	F909	A5	I102	E4	I715	D6
F301	B3	F910	A5	I103	E3	I716	D6
F302	D4	F911	B6	I104	E3	I717	E6
F303	D4	F912	E4	I105	E3	I718	E6
F305	D5	F913	B5	I106	E3	I719	B5
F306	C5	F951	A2	I107	E3	I720	D6
F307	D5	F952	A1	I108	E2	I721	B5
F308	E5	F954	E2	I109	E2	I722	B4
F309	E5	I001	C6	I110	E2	I901	B6
F310	D6	I002	C4	I111	E2	I902	A6
F311	D5	I003	C6	I112	E3	I904	B6
F312	C5	I004	D3	I113	E4	I905	A6
F313	C5	I005	C6	I114	E3	I906	B6
F314	D4	I006	C6	I115	E3	I907	A6
F315	D4	I008	C3	I116	E3	I908	E4
F401	D1	I009	B4	I301	D5	I909	B6
F402	C2	I010	B4	I302	D5	I910	B6
F403	B1	I011	D4	I303	D5	I911	B6
F404	C1	I012	D3	I304	D5	I912	A6
F405	C2	I013	B3	I306	D4	I913	A4
F406	C2	I014	D3	I307	D4	I951	A1
F407	B2	I015	B4	I308	D5	I952	A1
F408	C1	I016	C4	I309	D4	I953	A1
F409	D3	I017	B5	I310	D5	I954	A1
F410	D3	I018	B5	I311	D4	I955	A1
F411	D3	I019	C5	I312	E5	I956	D2
F412	D3	I020	C4	I313	D5	I957	E1
F413	C1	I021	C4	I371	D4		
F414	B1	I022	C5	I401	C2		
F415	B1	I023	C5	I402	D2		
F416	C1	I024	C5	I403	B1		
F417	C2	I025	C5	I404	B1		
F455	C2	I026	C4	I405	D2		
F456	C2	I027	C3	I406	D2		
F457	C3	I028	C4	I407	D2		
F471	E2	I029	D4	I408	D2		
F472	D2	I030	D4	I409	B3		
F473	D2	I031	D4	I410	B2		
F474	E1	I032	C3	I411	C2		
F475	E1	I033	C3	I412	C2		
F476	E1	I034	D3	I433	B3		
F477	E1	I035	D3	I435	B2		
F479	D1	I036	D3	I462	E1		
F480	D2	I037	C3	I463	E1		
F481	D2	I038	D3	I464	D1		
F482	D2	I039	D3	I465	D1		
F483	D2	I040	E3	I466	D2		

Testpoint Overview Front IR / LED Panel (Bottom Side)

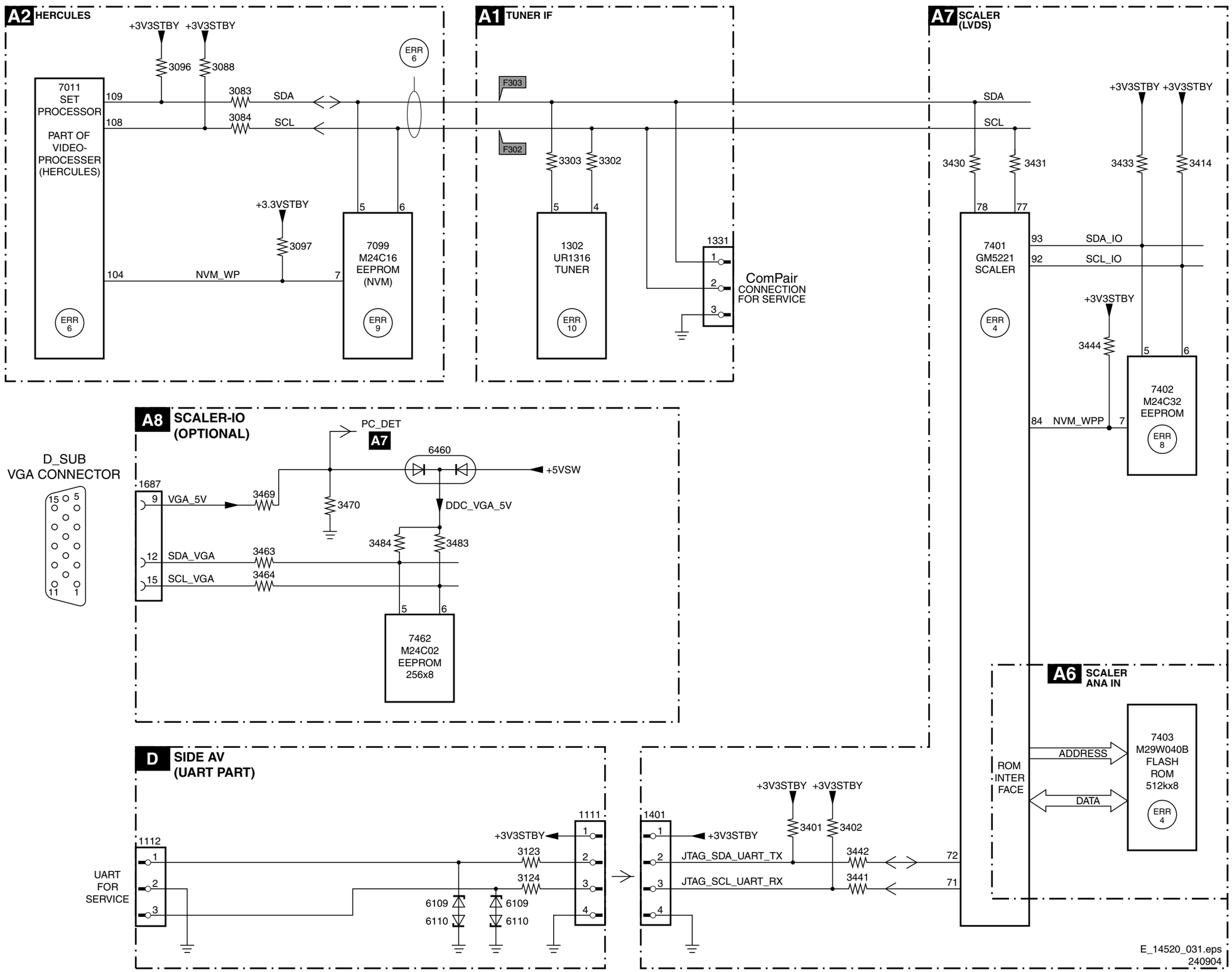


Personal Notes:

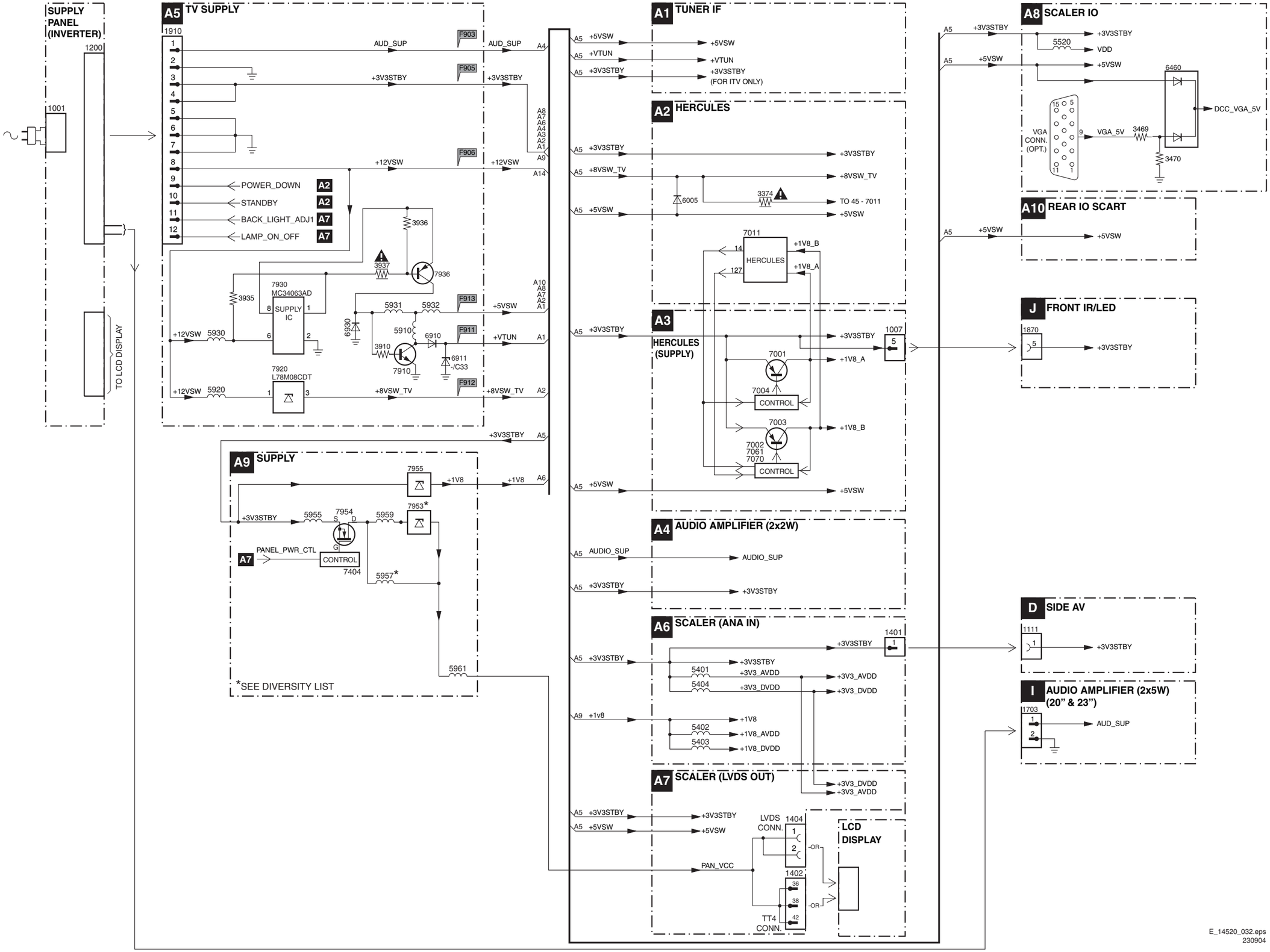
E_06532_012.eps
060804

I2C IC Overview

I2C BUS INTERCONNECTION DIAGRAM



Supply Voltage Overview

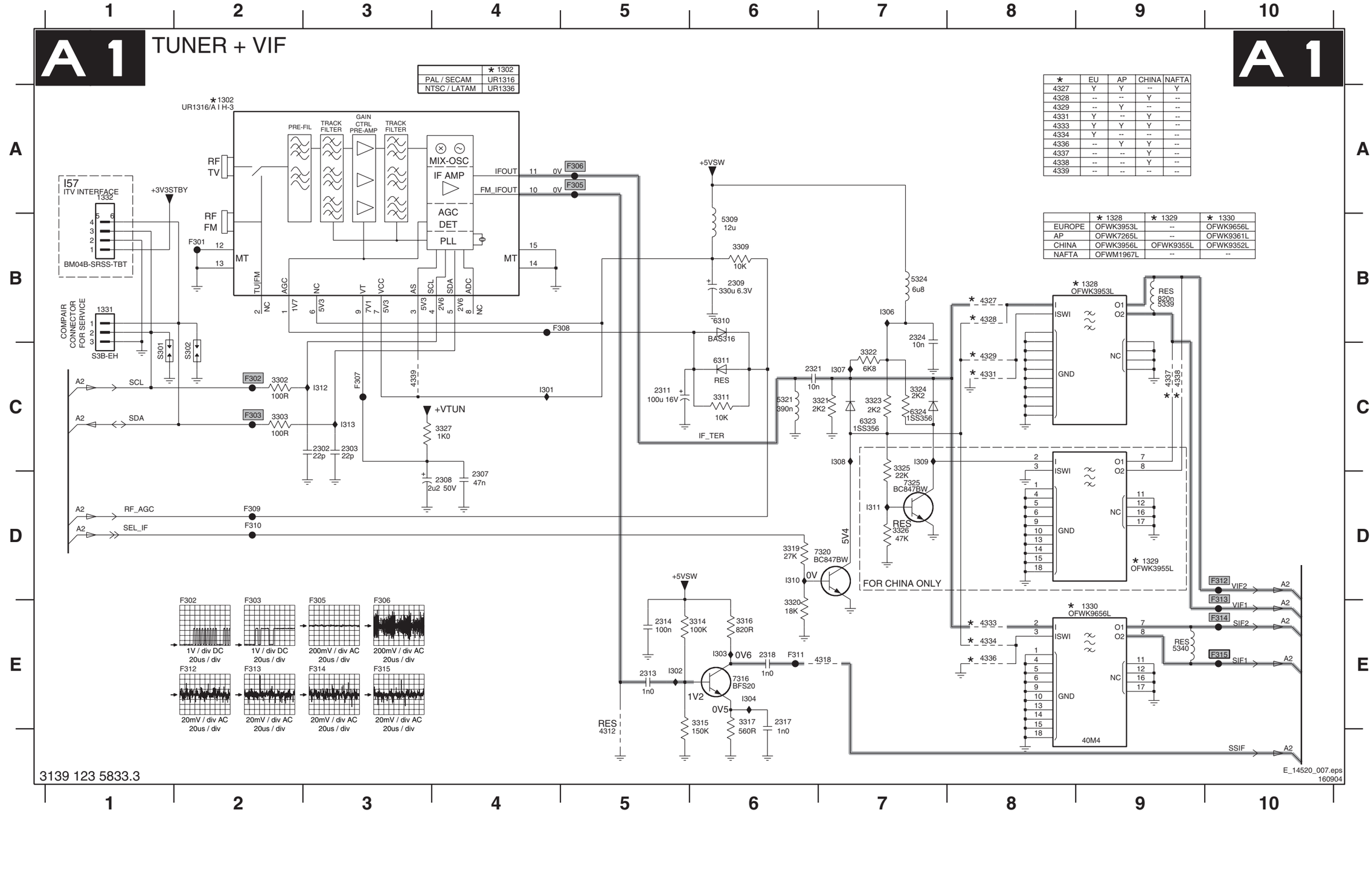


E_14520_032.eps
230904

7. Circuit Diagrams and PWB Layouts

TV & Scaler Board: Tuner & VIF

1302 A2	1331 B1	2307 D4	2313 E5	2321 C6	3309 B6	3316 E6	3321 C7	3325 C7	4318 E7	4331 C8	4337 C9	5321 C6	6310 B6	7316 E6	F302 C2	F307 C3	F311 E6	F315 E10	I304 E6	I309 C7	I313 C3
1328 B9	1332 A1	2308 D4	2314 E5	2324 B7	3311 C6	3317 E6	3322 C7	3326 D7	4327 B8	4333 E8	4338 C9	5324 B7	6311 C6	7320 D6	F303 C2	F308 B5	F312 D10	I301 C4	I306 B7	I310 D6	S301 C1
1329 D9	2302 C3	2309 B6	2317 E6	3302 C2	3314 E6	3319 D6	3323 C7	3327 C4	4328 B8	4334 E8	4339 C3	5339 B9	6323 C7	7325 D7	F305 A5	F309 D2	F313 E10	I302 E5	I307 C7	I311 D7	S302 C2
1330 E9	2303 C3	2311 C5	2318 E6	3303 C2	3315 E6	3320 D6	3324 C7	4312 E5	4329 C8	4336 E8	5309 B6	5340 E9	6324 C7	F301 B2	F306 A5	F310 D2	F314 E10	I303 E6	I308 C7	I312 C3	



★	EU	AP	CHINA	NAFTA
4327	Y	Y	--	Y
4328	--	--	Y	--
4329	--	Y	--	--
4331	Y	--	Y	--
4333	Y	Y	Y	--
4334	Y	--	--	--
4336	--	Y	Y	--
4337	--	--	Y	--
4338	--	--	Y	--
4339	--	--	--	--

	★ 1328	★ 1329	★ 1330
EUROPE	OFWK3953L	--	OFWK9656L
AP	OFWK7265L	--	OFWK9361L
CHINA	OFWK3956L	OFWK9355L	OFWK9352L
NAFTA	OFWM1967L	--	--

	★ 1302
PAL / SECAM	UR1316
NTSC / LATAM	UR1336

3139 123 5833.3

E_14520_007.eps
160904

TV & Scaler Board: Hercules

A2 HERCULES

A2

HERCULES
7011

TDA15001H	NAFTA
TDA15011H	AP-NSTC / LATAM
TDA15021H	EU / AP-PAL

FROM 11.08 OF SIDE AV BD

F006 — 1V / div DC, 20us / div
F007 — 200mV / div DC, 20us / div
I039 — 500mV / div DC, 20us / div
I041 — 500mV / div DC, 20us / div
I044 — 500mV / div DC, 20us / div

E_14520_008.eps
160904

3139 123 5833.3

| | | |

TV & Scaler Board: Hercules Supply

A3 HERCULES-SUPPLY

TO 1308 OF TOP CNTL BD

TO 1870 OF FRONT IR/LED BD

I57 ITV INTERFACE

1008 1007 1006

*EMC 2067 1n0

3063 2K2 6060 BZX384-C2V7

7060 PDTC114ET

F018 KEYBOARD A2
F017
F009 IR A2
I098 LED_SEL A2
PC_TV_LED A2
F050 LIGHT_SENSOR A2
F051 P50_LINE_ITV_IR_SW A2

3001 1R0 3002 22K 3003 1R0 3004 22K

7001 BC807-25 7003 BC807-25

7004 BC847BW 7002 BC847BW

F014 F015

2012 16V 100u 2024 16V 100u

2082 1u0 3066 4K7 3024 4K7 2001 220n 2083 10u

7061 BSH103 7070 BSH103

3089 150K 2079 22n

6061 BAS316

I095 HERC_RESET A2

I094 DECDIG A2

I093 I096 I002 I001 I003 I005 I006

SANDCASTLE A2

RES 3076 2K2 3005 2K2 3022 1K0 3023 10K 6002 BAS316 2014 100p I097

7015 BC847B 3021 820R 3037 68K

2003 47u 16V 3025 2K7 3036 56K

7005 NE555D COMP 2028 10n 3027 10K 3028 4K7 2015 3n3

7007 NE555D COMP 2045 10n

7006 NE555D COMP 2034 10n 3026 820R

3033 100K 3034 220K 6006 BAS316 2040 220p RES 3038

7016 BC847B 3031 470R 3032 1K8

2029 3n3 3029 1K0 3030 4K7

RES 4001 RES 4002

2042 3n3 3055 1K0 V_SDTV A8 3056 4K7

H_CS_SDTV A8

A2 VSYNC

F014 = 1V9 DC
F015 = 1V9 DC

E_14520_009.eps
170904

1006 B1
1007 B1
1008 A1
2001 B7
2003 C4
2012 B5
2014 C1
2015 E4
2024 B5
2028 D2
2029 F4
2034 E2
2040 E5
2042 E6
2045 D5
2067 A2
2079 A8
2082 B6
2083 B7
3001 A4
3002 A4
3003 A5
3004 A5
3005 C1
3021 D1
3022 C1
3023 C1
3024 B6
3025 C2
3026 E2
3027 D4
3028 D4
3029 F4
3030 F4
3031 F4
3032 F5
3033 E5
3034 E5
3036 C4
3037 D1
3038 F5
3055 E6
3056 E7
3063 A3
3066 B6
3076 C1
3089 A8
4001 F1
4002 F6
6002 C2
6006 E5
6060 A3
6061 A9
7001 A4
7002 B5
7003 A5
7004 B4
7005 D3
7006 E3
7007 D5
7015 D1
7016 E5
7060 B3
7061 A7
7070 A8
F009 B2
F014 B4
F015 B4
F017 B2
F018 B2
F050 C2
F051 C2
I001 A5
I002 B6
I003 A5
I005 A4
I006 A4
I093 A8
I094 A9
I095 A9
I096 B6
I097 D1
I098 B2
I099 B3

TV & Scaler Board: Audio Amplifier (2x2W)

A 4 AUDIO AMPLIFIER (2x2W)

A 4

FOR 14, 15, 17 INCH

AUDIO AMP 2 X 2W

7712 TDA1517ATW

AUD_SUP (10V)

2719 100n P_GND

2714 470u 16V P_GND

VP1 VP2

A2 AUDOUTLSL F707 3744 100R I719 2718 1u0 I706 IN1+ 3

A2 AUDOUTLSR F708 3745 100R I701 2712 1u0 I707 IN2- 18

3727 10K *EMC 2742 470p

3726 10K *EMC 2741 470p

POWER AMPLIFIER

OUT1A 8 OUT1 I710 2736 470u 16V I721 1701 1 L TO 1110 OF SIDE AV

OUT1B 9

OUT2A 12 OUT2 I711 2737 470u 16V I722 2 GND D

OUT2B 13 3 R

EMC 2738 1n0 EMC 2739 1n0 P_GND

MODE 17

SVRR 5

I709 2724 100u 16V

NC 1 2 6 7 14 19 20

PGND

SGND 1 2 HS 4 10 11 21

P_GND P_GND F710 P_GND

+3V3STBY 3719 10K I720 3V3

AUD_SUP 3717 10K I714 3706 10K I708

11V2 7702 BC847BW 3V2

+3V3STBY 3725 10K 7703 BC847BW I715 11V2 3722 8K2

3V3 I705

2703 10u 16V 2704 1u0 2705 1u0

A2 STANDBY * 4703 _ 3V3 I716

4X AND GATES +3V3STBY

A2 SOUND_ENABLE F701 3V3 7706-1 74LVC08AD 1 3 3V3

POWER_DOWN A2,A4,A5 3V3 2

7706-2 74LVC08AD 4 5 6

7706-3 74LVC08AD 9 10 8

7706-4 74LVC08AD 12 11 3V3

A2 EXT_MUTE F702 3V3 13

* 4704 _

+3V3STBY 3730 3K3 0V F709 OUT_MUTE A2

I718 3732 1K0 I717 0V7 7710 BC847BW

FOR 20, 23 INCH

A2 STANDBY 3V2

A2 AUDOUTLSL 0V

A2 AUDOUTLSR 0V

3V3

1706 1 2 3 4 5 TO 1706 OF AUD AMP 2X5W I

MUTE

5706

*	
4703	RES
4704	RES

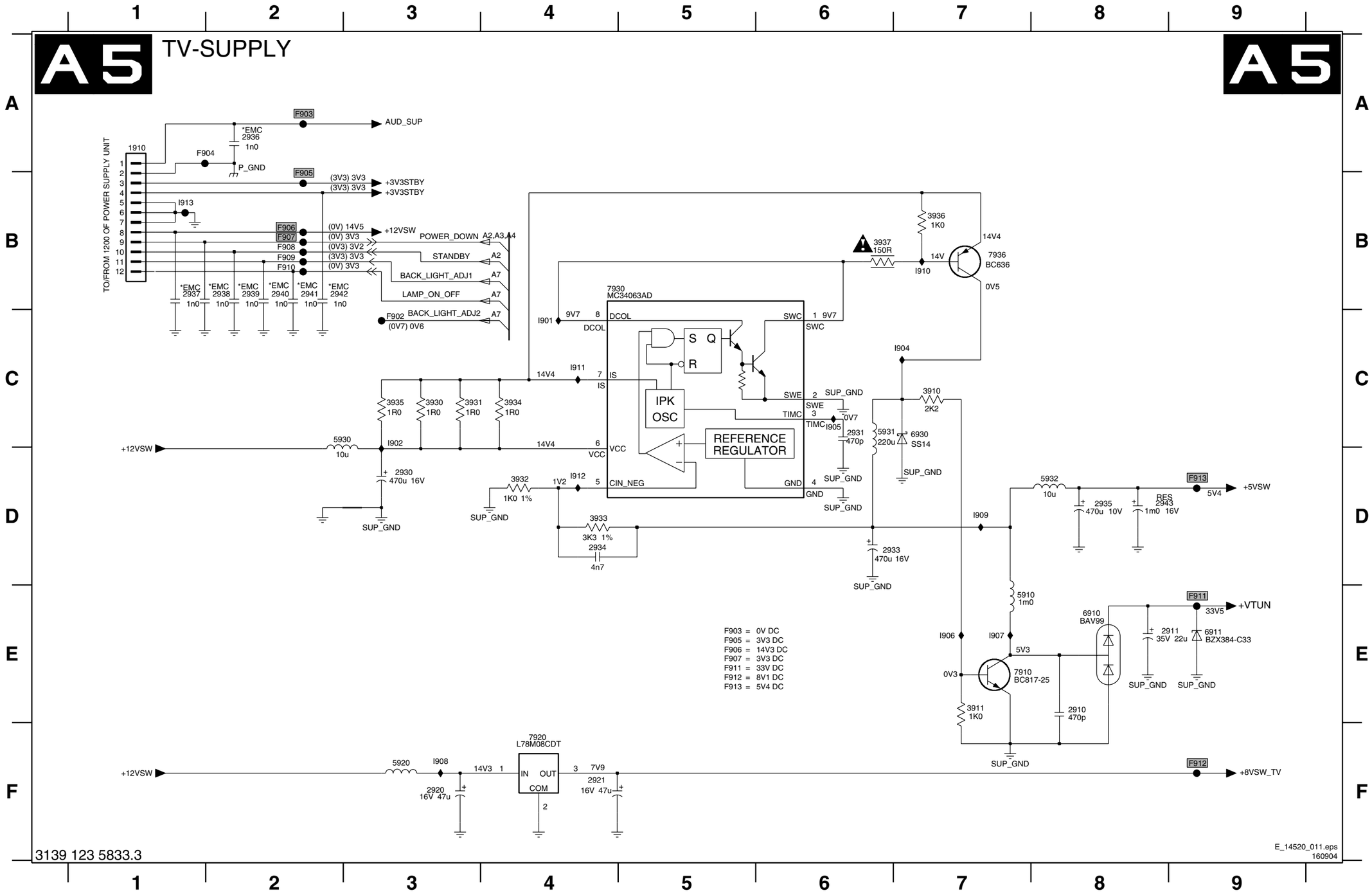
E_14520_010.eps
160904

3139 123 5833.3

1701 B8
1706 D5
2703 C3
2704 C4
2705 C4
2712 B3
2714 A6
2718 B3
2719 A5
2724 C5
2736 B6
2737 B6
2738 B7
2739 B7
2741 C4
2742 B4
3706 C3
3717 C2
3719 C2
3722 C3
3725 C2
3726 C3
3727 B3
3730 E3
3732 F3
3744 B1
3745 B1
4703 D2
4704 F2
5706 D5
7702 C2
7703 C3
7706-1 D2
7706-2 E2
7706-3 E2
7706-4 F2
7710 F3
7712 B5
F701 D1
F702 F1
F707 B1
F708 C1
F709 E3
F710 C6
I701 B2
I705 D3
I706 B4
I707 B4
I708 C4
I709 B5
I710 B6
I711 B6
I714 C3
I715 C3
I716 D3
I717 F3
I718 F2
I719 B2
I720 C2
I721 B7
I722 B7

TV & Scaler Board: TV Supply

A5 TV-SUPPLY



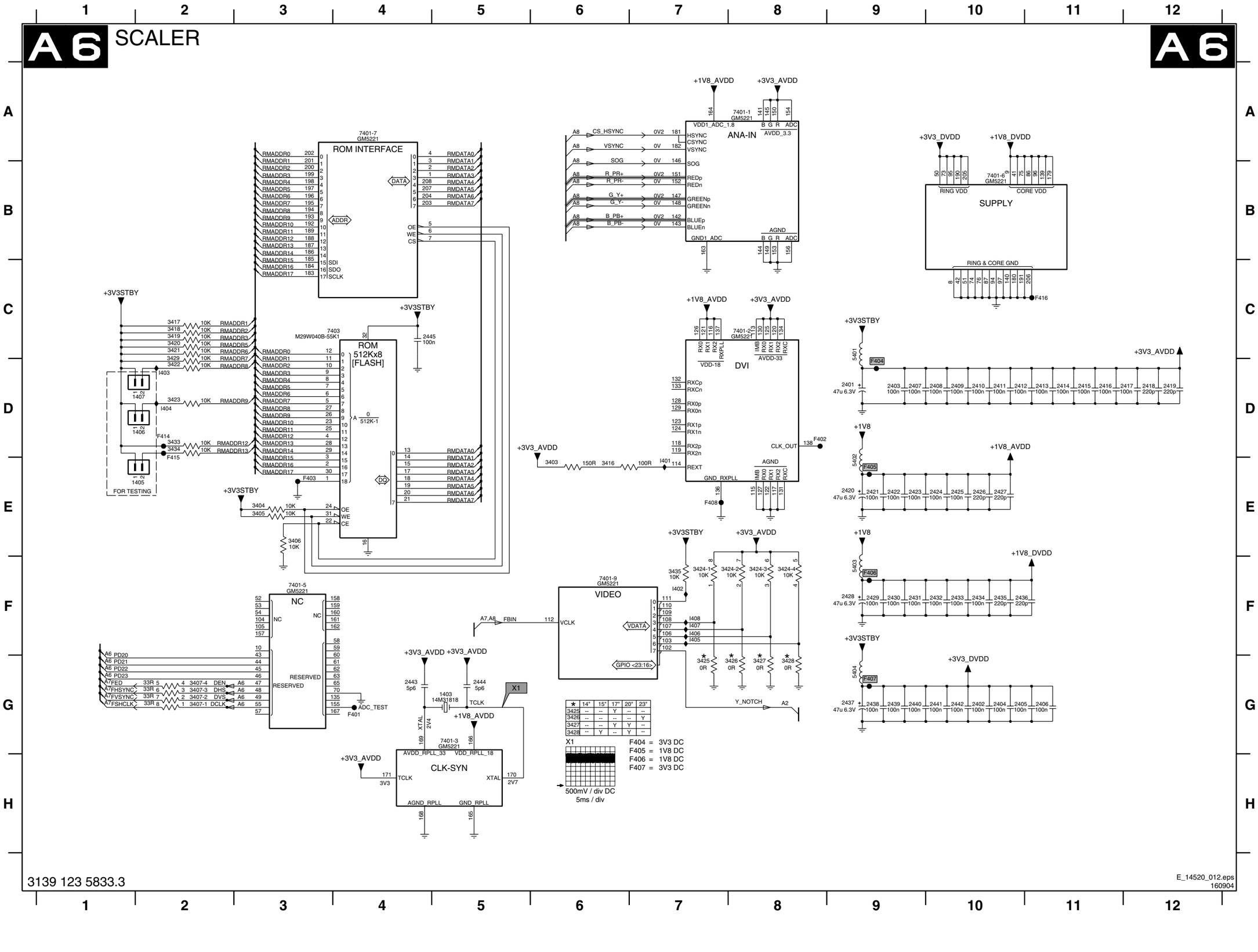
3139 123 5833.3

E_14520_011.eps
160904

1910 A1
2910 E8
2911 E9
2920 F3
2921 F4
2930 D3
2931 C6
2933 D6
2934 D4
2935 D8
2936 A2
2937 B1
2938 B2
2939 B2
2940 B2
2941 B2
2942 B2
2943 D8
3910 C7
3911 E7
3930 C3
3931 C3
3932 D4
3933 D4
3934 C4
3935 C3
3936 B7
3937 B6
5910 E7
5920 F3
5930 C2
5931 C6
5932 D8
6910 E8
6911 E9
6930 C7
7910 E7
7920 F4
7930 B4
7936 B7
F902 C3
F903 A2
F904 A1
F905 B2
F906 B2
F907 B2
F908 B2
F909 B2
F910 B2
F911 E9
F912 F9
F913 D9
I901 C4
I902 C3
I904 C7
I905 C6
I906 E7
I907 E7
I908 F3
I909 D7
I910 B7
I911 C4
I912 D4
I913 B1

TV & Scaler Board: Scaler

A6 SCALER

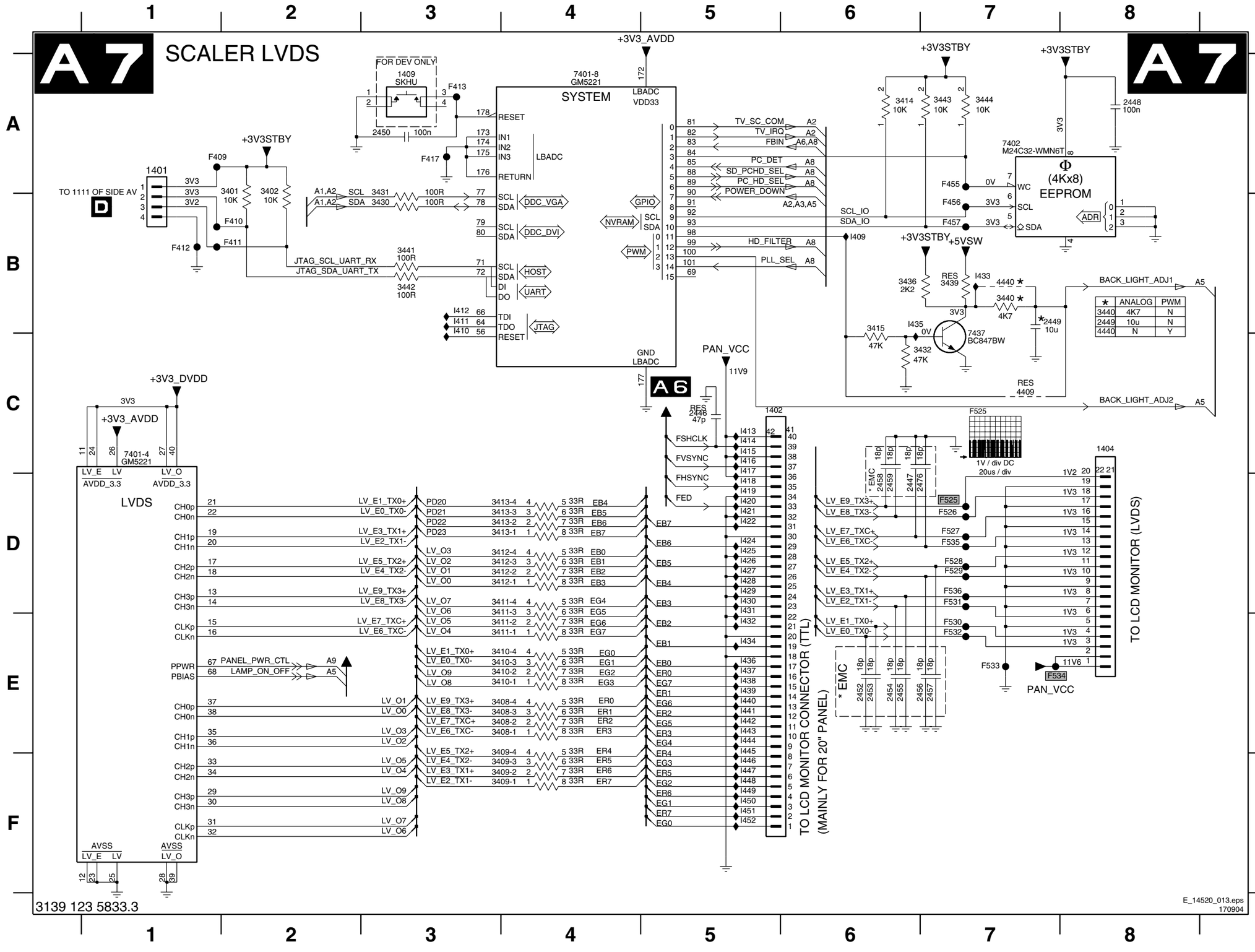


1403 G5
1405 E2
1406 D2
1407 D2
2401 D9
2402 G10
2403 D9
2404 G10
2405 G10
2406 G11
2407 D9
2408 D10
2409 D10
2410 D10
2411 D10
2412 D10
2413 D11
2414 D11
2415 D11
2416 D11
2417 D12
2418 D12
2419 D12
2420 E9
2421 E9
2422 E9
2423 E9
2424 E10
2425 E10
2426 E10
2427 E10
2428 F9
2429 F9
2430 F9
2431 F9
2432 F10
2433 F10
2434 F10
2435 F10
2436 F10
2437 G9
2438 G9
2439 G9
2440 G9
2441 G10
2442 G10
2443 G4
2444 G5
2445 C4
3403 E6
3404 E3
3405 E3
3406 E3
3407-1 G2
3407-2 G2
3407-3 G2
3407-4 G2
3416 E6
3417 C2
3418 C2
3419 C2
3420 C2
3421 C2
3422 D2
3423 D2
3424-1 F7
3424-2 F8
3424-3 F8
3424-4 F8
3425 G7
3426 G8
3427 G8
3428 G8
3429 D2
3433 D2
3434 D2
3435 F7
5401 C9
5402 E9
5403 F9
5404 G9
7401-1 A8
7401-2 C8
7401-3 G5
7401-5 F3
7401-6 B10
7401-7 A4
7401-9 F6
7403 C4
F401 G4
F402 D8
F403 E3
F404 D9
F405 E9
F406 F9
F407 G9
F408 E7
F414 D2
F415 E2
F416 C11
I401 E7
I402 F7
I403 D2
I404 D2
I405 F7
I406 F7
I407 F7
I408 F7

3139 123 5833.3

E_14520_012.eps
160904

TV & Scaler Board: Scaler LVDS



★	ANALOG	PWM
3440	4K7	N
2449	10u	N
4440	N	Y

1401	A1	I409	B6
1402	C5	I410	B3
1404	C8	I411	B3
1409	A3	I412	B3
2446	C5	I413	C5
2447	D6	I414	C5
2448	A8	I415	C5
2449	B7	I416	C5
2450	A3	I417	C5
2452	E6	I418	D5
2453	E6	I419	D5
2454	E6	I420	D5
2455	E6	I421	D5
2456	E7	I422	D5
2457	E7	I424	D5
2458	D6	I425	D5
2459	D6	I426	D5
2476	D7	I427	D5
3401	A2	I428	D5
3402	A2	I429	D5
3408-1	E4	I430	D5
3408-2	E4	I431	D5
3408-3	E4	I432	E5
3408-4	E4	I433	B7
3409-1	F4	I434	E5
3409-2	F4	I435	B6
3409-3	F4	I436	E5
3409-4	F4	I437	E5
3410-1	E4	I438	E5
3410-2	E4	I439	E5
3410-3	E4	I440	E5
3410-4	E4	I441	E5
3411-1	E4	I442	E5
3411-2	E4	I443	E5
3411-3	E4	I444	E5
3411-4	D4	I445	E5
3412-1	D4	I446	F5
3412-2	D4	I447	F5
3412-3	D4	I448	F5
3412-4	D4	I449	F5
3413-1	D4	I450	F5
3413-2	D4	I451	F5
3413-3	D4	I452	F5
3413-4	D4		
3414	A6		
3415	B6		
3430	B3		
3431	B3		
3432	C7		
3436	B6		
3439	B7		
3440	B7		
3441	B3		
3442	B3		
3443	A7		
3444	A7		
4409	C7		
4440	B7		
7401-4	C1		
7401-8	A4		
7402	A7		
7437	C7		
F409	A1		
F410	B2		
F411	B2		
F412	B1		
F413	A3		
F417	A3		
F455	A7		
F456	B7		
F457	B7		
F525	D7		
F526	D7		
F527	D7		
F528	D7		
F529	D7		
F530	E7		
F531	D7		
F532	E7		
F533	E7		
F534	E7		
F535	D7		
F536	D7		

TV & Scaler Board: Scaler IO

A8 SCALER IO

*	VGA	NON-VGA
4460	--	Y
4461	--	Y
4462	--	Y
4463	--	Y
4464	--	Y

F499 1V / div DC 20us / div
F501 1V / div DC 20us / div
F502 1V / div DC 5ms / div
F503 1V / div DC 5ms / div

I57 ITV INTERFACE
1462 BM05B-SRSS-TBT
SC1_CVBS_RF_OUT A10/ A2
H_CS_SDTV A3
V_SDTV A3

R_SDTV F471 3507 220R I512 2477 1u0 3502 220R
G_SDTV F472 3503 220R I513 2478 1u0 3504 220R
B_SDTV F473 3505 220R I514 2479 1u0 3506 220R

1461 D-SUB
F474 RED_PR
F475 GREEN_Y
F476 BLUE_PB
2480 2481 2482 1u0 I480 I481 I482
3477 3476 3475 22R I483 I484 I485
S460 3474 75R S461 3473 75R S462 3472 75R
F477 VGA_5V
F479 HS
F481 VS
F480 I515
F482 3481 3482 1K0 I466 I467
DDC_VGA_5V F483
S463 S464
3483 3484 10K 2460 100n
7462 M24C02-WMN6 5V3
Φ (256x8) EEPROM
WC SCL SDA ADR
I486 I487
3464 3463 100R
22p 2K2 2461 2462 3467 3468

SD/HD SELECTION
* 4460 * 4461 * 4462
7461 SM5301BS-G 5V4
VCC Φ VCC
DISABLE THROUGH MUXSEL GSR1 RINA|YINA RINB|YINB GSG1 GINA|UINA GINB|UINB GSB1 BINA|VINA BINB|VINB RFC VFC
NC1 NC2 NC3 ROUT|YOUT GOUT|UOUT BOUT|VOUT
I462 I463 I464 I465
33p 820R 2451 3471
GND GND_HS

+5VSW 5462 F489
VGA_5V 3469 150R S465 3470 10K
6460 KDR721S DDC_VGA_5V
2471 47u 6.3V 2472 2473 2474 2475 100n
F487 PC_HD_SEL A7
F488 PC_DET A7

I470 I471 I472
3496 3497 3498 3499 3480 3479 22R
I473 I474 I475 I476 I477 I478 I479
2464 2465 2466 2467 2468 2469 2470 10n
F490 F491 F492 F493 F494 F495 F496
SOG A6
R_PR+ A6
R_PR- A6
G_Y+ A6
G_Y- A6
B_PB+ A6
B_PB- A6

I516 3478 100K 2483 100n
F497 HD_FILTER A7
F498 SD_PCHD_SEL A7

RES 4510 +3V3STBY 2510 100n
7510-1 74LVC14APW I519 0V2
7510-2 74LVC14APW I510 0V2 3512 220R F499 CS_HSYNC A6
7510-3 74LVC14APW I520 0V
7510-4 74LVC14APW I511 3513 220R F503 VSYNC A6
3V3
RES 4511
4X INVERTER SCHMITT-TRIGGER
7510-5 74LVC14APW
7510-6 74LVC14APW
4519 RES 4518

SYNC SELECTION +3V3STBY
7463 74HC4053D VDD MDX G4
4X1 4X2
I517 I518 0V2 0V
3511 220R 2512 100p 2511 100p 220R 3510
2463 100n
3501 10K
* 4463 * 4464

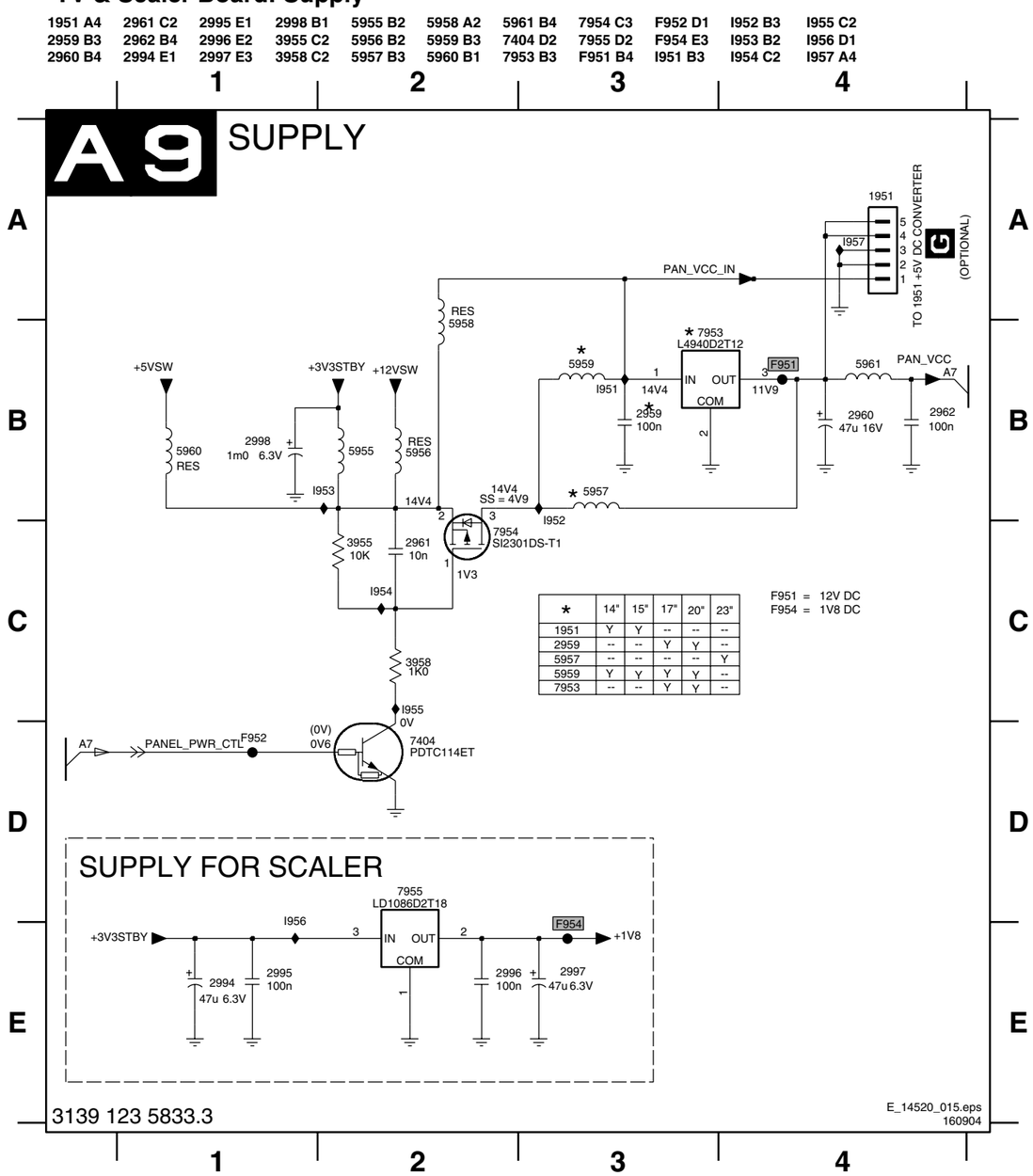
A3 H_CS_SDTV F501
A3 V_SDTV F502
A7 PLL_SEL F521
A6,A7 FBIN F520 3519 RES 0R 2514
7520 MK1575-01
FBIN NC FCLK OE CLK2 FS2 CLK1 CHPR
REFIN FS0 VDDA VDDD FS1 GNDA GNDD CHGP
I492 I496 4520
2518 10n 2517 10n
3520 33K 2516 680p I493 I494 2515 10n
VDD 2513 10u 16V 2519 1n0 5520 +3V3STBY 2520 100n

3139 123 5833.3
E_14520_014.eps 160904

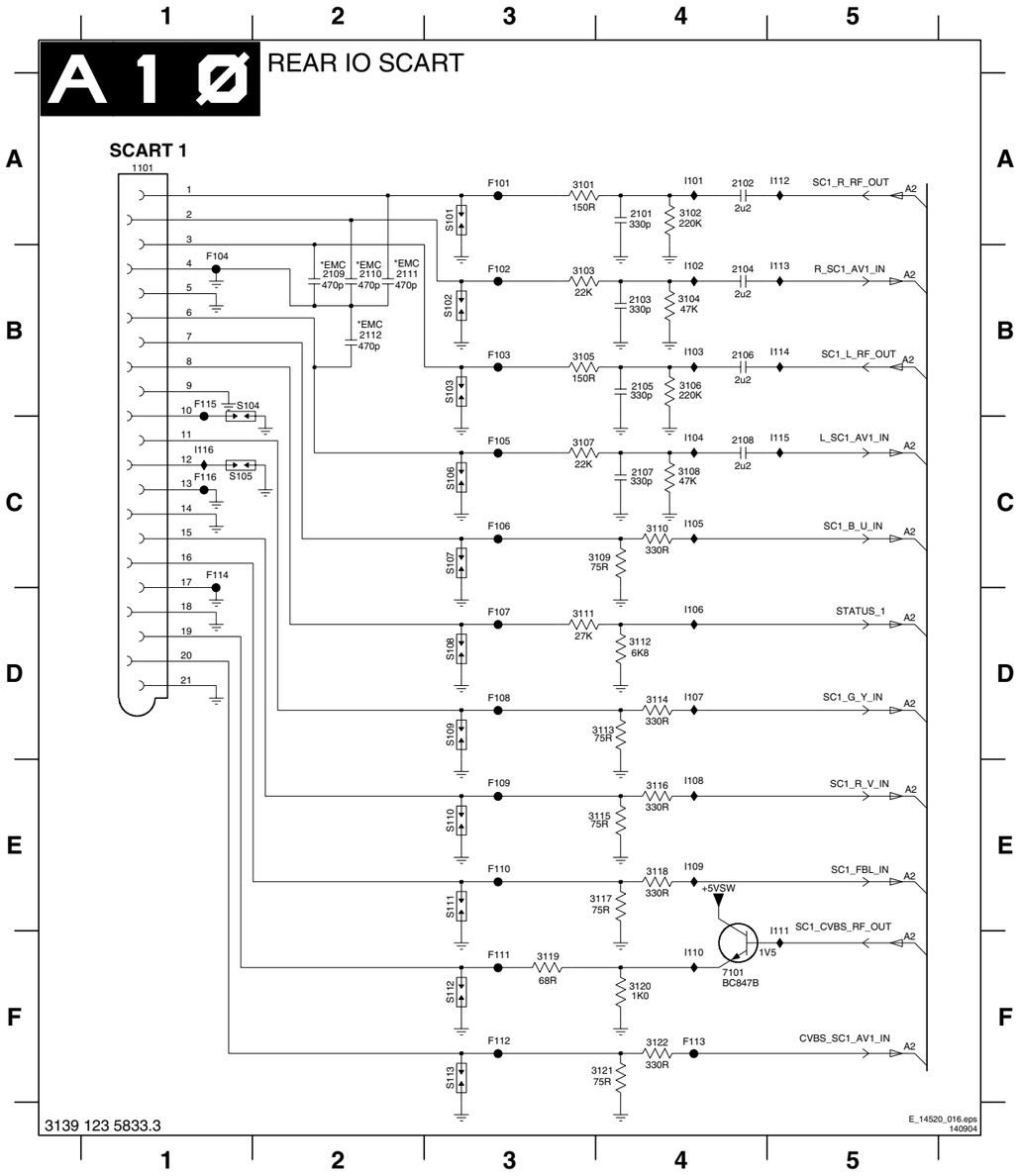
1461 B1	4462 B5	I493 F3
1462 A8	4463 F6	I494 F3
2451 D5	4464 F6	I496 F3
2460 C2	4510 D7	I510 E8
2461 D4	4511 F7	I511 E8
2462 D4	4518 F8	I512 A3
2463 E6	4519 F7	I513 A3
2464 C8	4520 F3	I514 B3
2465 C8	5462 B6	I515 C1
2466 C8	5520 F4	I516 D6
2467 C8	6460 B8	I517 E6
2468 C8	7461 B5	I518 E6
2469 D8	7462 D3	I519 E7
2470 D8	7463 E5	I520 E7
2471 B6	7510-1 D7	S460 C2
2472 B6	7510-2 D8	S461 C2
2473 B7	7510-3 E7	S462 C3
2474 B7	7510-4 E8	S463 C2
2475 B7	7510-5 F7	S464 C2
2477 A3	7510-6 F8	S465 B7
2478 A3	7520 F2	
2479 B3	F471 A1	
2480 B3	F472 A1	
2481 B3	F473 B1	
2482 B3	F474 B1	
2483 D6	F475 B1	
2510 D8	F476 B1	
2511 E7	F477 C1	
2512 E6	F479 C1	
2513 F3	F480 C1	
2514 F2	F481 C1	
2515 F3	F482 C2	
2516 F3	F483 C3	
2517 F4	F487 A7	
2518 F4	F488 A7	
2519 F4	F489 B6	
2520 F4	F490 C8	
3463 D2	F491 C8	
3464 D2	F492 C8	
3467 D4	F493 C8	
3468 D4	F494 C8	
3469 B7	F495 C8	
3470 B7	F496 D8	
3471 D5	F497 D8	
3472 C3	F498 D8	
3473 C2	F499 E9	
3474 C2	F501 E1	
3475 B3	F502 E1	
3476 B3	F503 E9	
3477 B3	F520 E1	
3478 D7	F521 E1	
3479 D7	I462 C5	
3480 D7	I463 D5	
3481 C2	I464 D5	
3482 C2	I465 D5	
3483 C2	I466 C3	
3484 C2	I467 C3	
3496 C7	I470 C6	
3497 C7	I471 C6	
3498 C7	I472 D6	
3499 C7	I473 C8	
3501 F5	I474 C8	
3502 A3	I475 C8	
3503 A2	I476 C8	
3504 A3	I477 C8	
3505 B2	I478 C8	
3506 B3	I479 D8	
3507 A2	I480 B3	
3510 E6	I481 B3	
3511 E6	I482 B3	
3512 E9	I483 B4	
3513 E9	I484 B4	
3519 E2	I485 B4	
3520 F3	I486 D2	
4460 B5	I487 D2	
4461 B5	I492 E4	

TV & Scaler Board: Supply

1951 A4 2959 B3 2960 B4 2961 C2 2962 B4 2994 E1 2995 E1 2996 E2 2997 E3 2998 B1 3955 C2 3958 C2 5955 B2 5956 B2 5957 B3 5958 A2 5959 B3 5960 B1 7404 D2 7953 B3 7954 C3 7955 D2 F951 B4 F952 D1 F954 E3 I951 B3 I952 B3 I953 B2 I954 C2 I955 C2 I956 D1 I957 A4

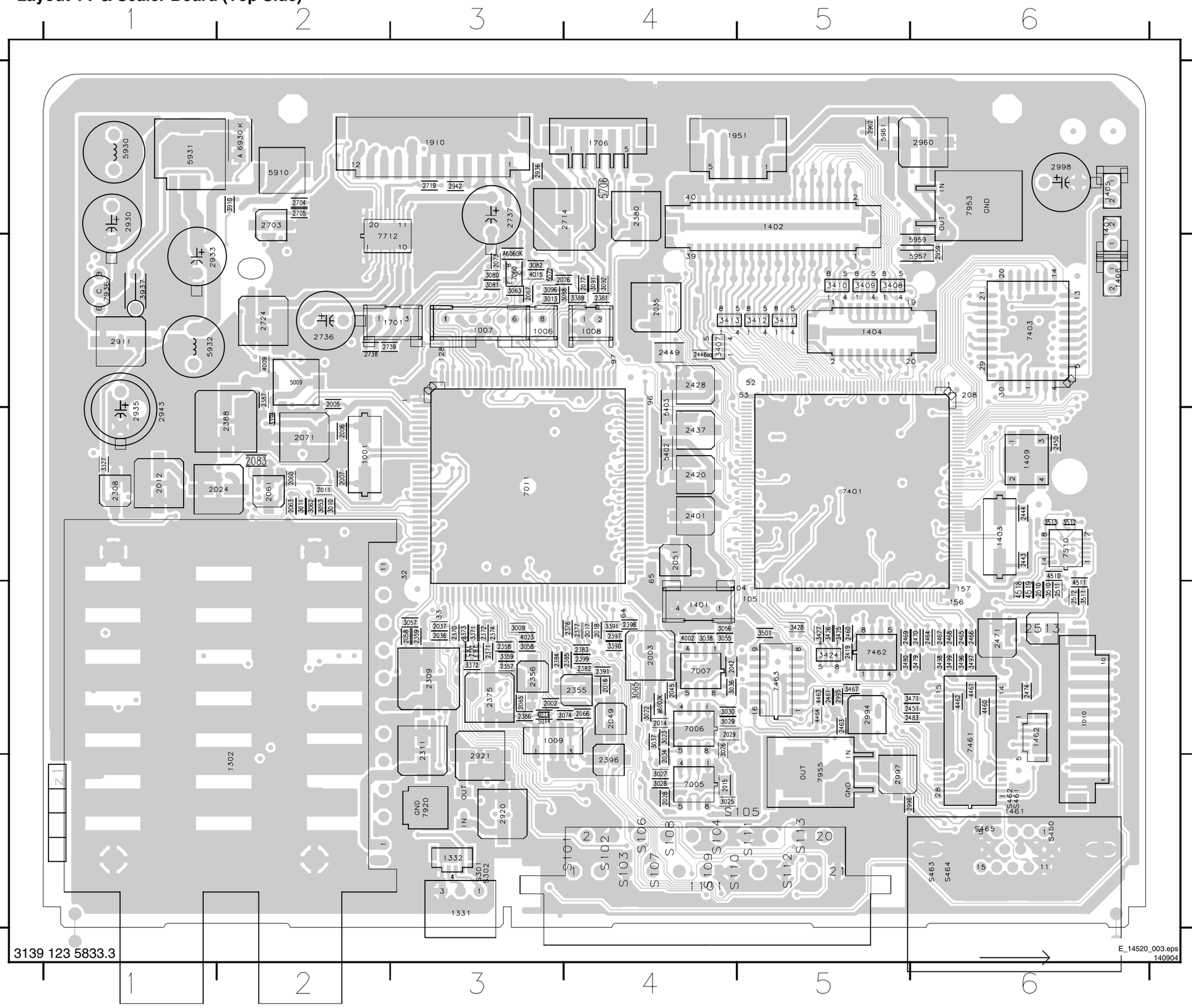


TV & Scaler Board: Rear IO Scart



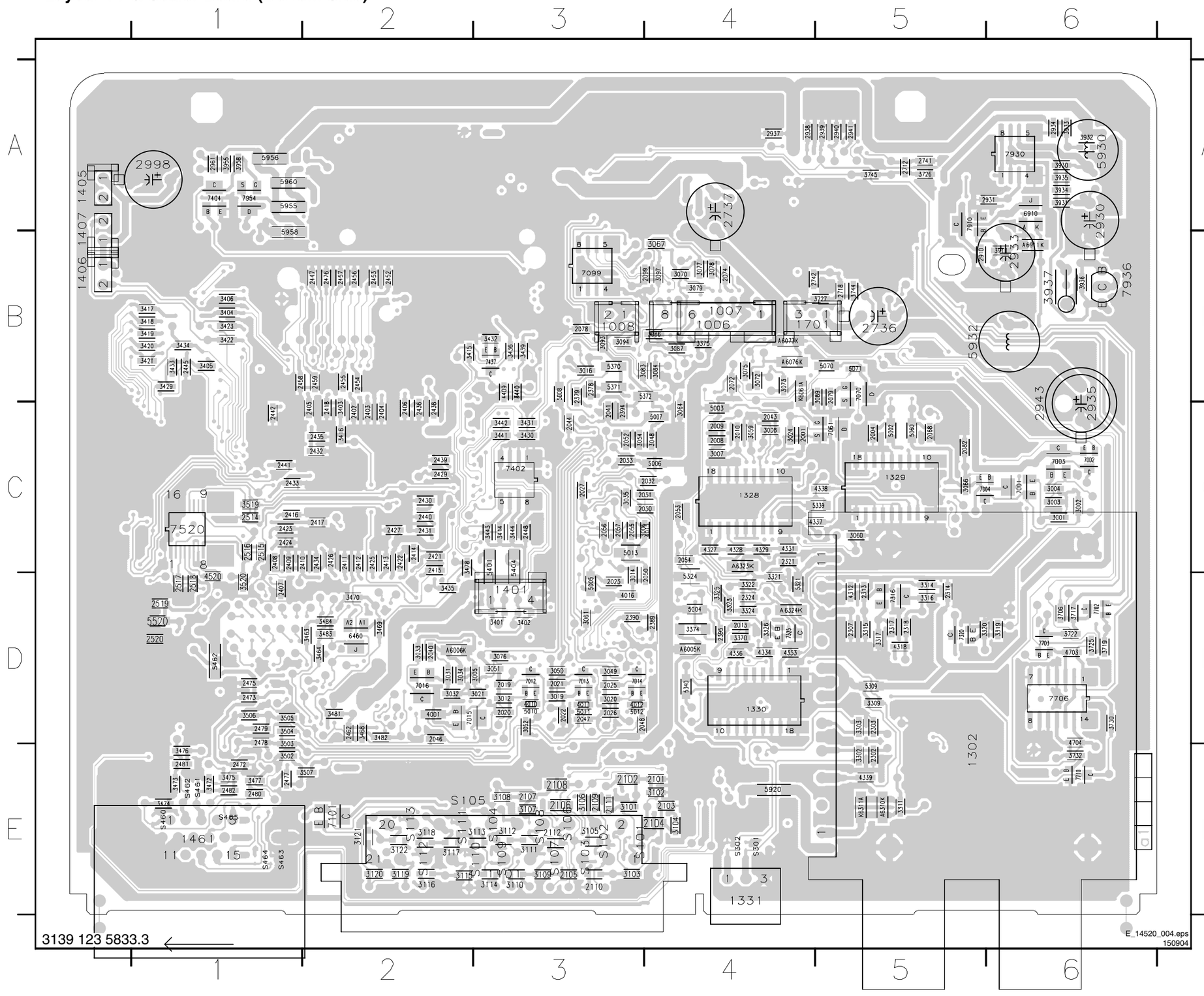
1101 A1
2101 A4
2102 A4
2103 B4
2104 B4
2105 B4
2106 B4
2107 C4
2108 C4
2109 B2
2110 B2
2111 B2
2112 B2
3101 A3
3102 A4
3103 B3
3104 B4
3105 B3
3106 B4
3107 C3
3108 C4
3109 C4
3110 C4
3111 D3
3112 D4
3113 D4
3114 D4
3115 E4
3116 E4
3117 E4
3118 E4
3119 F3
3120 F4
3121 F4
3122 F4
7101 F4
F101 A3
F102 B3
F103 B3
F104 B1
F105 C3
F106 C3
F107 D3
F108 D3
F109 E3
F110 E3
F111 F3
F112 F3
F113 F4
F114 C1
F115 B1
F116 C1
I101 A4
I102 B4
I103 B4
I104 C4
I105 C4
I106 D4
I107 D4
I108 E4
I109 E4
I110 F4
I111 E5
I112 A5
I113 B5
I114 B5
I115 C5
I116 C1
S101 A3
S102 B3
S103 B3
S104 B1
S105 C1
S106 C3
S107 C3
S108 D3
S109 D3
S110 E3
S111 E3
S112 F3
S113 F3

Layout TV & Scaler Board (Top Side)



1006	B3	2419	D5	3389	B4	5009	B2
1007	B3	2420	C4	3390	D4	5014	D3
1008	B4	2428	B4	3391	D4	5072	B3
1009	D3	2437	C4	3394	C2	5402	C4
1010	D6	2443	C6	3407	B4	5403	C4
1101	E4	2444	C6	3408	B5	5706	A4
1302	E2	2446	B4	3409	B5	5910	A2
1331	E3	2449	B4	3410	B5	5930	A1
1332	E3	2450	C6	3411	B5	5931	A1
1401	D4	2451	D6	3412	B5	5932	B1
1402	A5	2460	D5	3413	B4	5957	B6
1403	C6	2461	D5	3424	D5	5959	B6
1404	B5	2463	D5	3425	D5	5961	A5
1405	A6	2464	D6	3426	D5	6002	D4
1406	B6	2465	D6	3427	D5	6060	B3
1407	A6	2466	D6	3428	D5	6930	A2
1409	C6	2467	D6	3467	D5	7005	E4
1461	E6	2468	D6	3471	D6	7006	D4
1462	D6	2469	D5	3479	D6	7007	D4
1701	B3	2470	D6	3480	D5	7011	C3
1706	A4	2471	D6	3496	D6	7060	B3
1910	A3	2474	D6	3497	D6	7370	D3
1951	A5	2483	D6	3498	D6	7401	C5
2002	D3	2510	D6	3499	D6	7403	B6
2003	D4	2511	D6	3501	D5	7461	D6
2005	B2	2512	D6	3510	D6	7462	D5
2006	C2	2513	D6	3511	D6	7463	D5
2007	C2	2703	A2	3512	C6	7510	C6
2011	C2	2704	A2	3513	C6	7712	B2
2012	C1	2705	A2	3910	A2	7920	E3
2014	D4	2714	A4	3937	B1	7936	B1
2015	E4	2719	A3	4002	D4	7953	A6
2016	D4	2724	B2	4009	B2	7955	E5
2017	D4	2736	B2	4014	D3		
2018	D4	2737	A3	4015	B3		
2024	C2	2738	B2	4023	D3		
2028	E4	2739	B2	4460	D6		
2029	D4	2911	B1	4461	D6		
2034	E4	2920	E3	4462	D6		
2035	B4	2921	E3	4463	D5		
2036	D3	2930	A1	4464	D5		
2037	D3	2933	B1	4510	C6		
2042	D4	2935	C1	4511	D6		
2045	D4	2936	A3	4518	D6		
2049	D4	2942	A3	4519	D6		
2051	C4	2943	C1	5009	B2		
2058	D3	2959	B6	5014	D3		
2060	C2	2960	A6	5072	B3		
2061	C2	2962	A5	5402	C4		
2063	C2	2994	D5	5403	C4		
2065	D3	2995	D5	5706	A4		
2066	D4	2996	E5	5910	A2		
2067	B3	2997	E5	5930	A1		
2071	C2	2998	A6	5931	A1		
2073	B3	3009	D3	5932	B1		
2076	B3	3010	C2	5957	B6		
2077	B4	3011	C2	5959	B6		
2083	C2	3013	B3	5961	A5		
2308	C1	3022	D4	6002	D4		
2309	D3	3023	D4	6060	B3		
2311	D3	3025	E4	6930	A2		
2355	D4	3026	D4	7005	E4		
2356	D3	3027	E4	7006	D4		
2357	D3	3028	E4	7007	D4		
2358	D3	3029	D4	7011	C3		
2359	D3	3030	D4	7060	B3		
2370	D3	3036	D4	7370	D3		
2371	D3	3037	D4	7401	C5		
2372	D3	3038	D4	7403	B6		
2373	D3	3053	C2	7461	D6		
2374	D3	3055	D4	7462	D5		
2375	D3	3056	D4	7463	D5		
2376	D4	3057	D3	7510	C6		
2377	D4	3058	D3	7712	B2		
2380	A4	3062	C2	7920	E3		
2381	B4	3063	B3	7936	B1		
2382	D4	3065	D4	7953	A6		
2383	D4	3074	D4	7955	E5		
2384	D3	3080	B3				
2385	D4	3081	B3				
2386	D3	3082	B3				
2387	B2	3088	B4				
2388	C2	3091	B4				
2391	D4	3092	B4				
2396	E4	3096	B3				
2397	D4	3327	C1				
2398	D4	3359	D3				
2399	D4	3371	D3				
2401	C4	3372	D3				

Layout TV & Scaler Board (Bottom Side)



1328	C4	2425	C2	3070	B4	3469	D2	5520	D1
1329	C5	2426	C2	3072	B4	3470	D2	5920	E4
1330	D4	2427	C2	3073	B4	3472	E1	5955	A1
2001	C4	2429	C2	3075	B4	3473	E1	5956	A1
2004	C5	2430	C2	3076	D3	3474	E1	5958	B1
2008	C4	2431	C2	3077	B4	3475	E1	5960	A1
2009	C4	2432	C2	3078	B4	3476	E1	6005	D4
2010	C4	2433	C1	3079	B4	3477	E1	6006	D2
2013	D4	2434	C2	3083	B3	3478	C2	6061	B4
2019	D3	2435	C2	3084	B4	3481	D2	6073	B4
2020	D3	2436	C2	3086	B4	3482	D2	6076	B4
2021	D3	2438	C2	3087	B4	3483	D2	6310	E5
2022	D3	2439	C2	3089	B5	3484	D2	6311	E5
2023	D3	2440	C2	3093	B3	3502	E1	6323	C4
2025	D3	2441	C1	3094	B3	3503	E1	6324	D4
2026	D3	2442	C1	3097	B4	3504	D1	6460	D2
2027	C3	2445	B1	3101	E3	3505	D1	6910	A6
2030	C4	2447	B2	3102	E4	3506	D1	6911	B6
2031	C4	2448	C3	3103	E3	3507	E2	7001	C6
2032	C4	2452	B2	3104	E4	3519	C1	7002	C6
2033	C3	2453	B2	3105	E3	3520	D1	7003	C6
2040	D2	2454	B2	3106	E3	3706	D6	7004	C5
2041	C3	2455	B2	3107	E3	3717	D6	7012	D3
2043	C4	2456	B2	3108	E3	3719	D6	7013	D3
2044	C3	2457	B2	3109	E3	3722	D6	7014	D3
2046	D2	2458	B1	3110	E3	3725	D6	7015	D2
2047	D3	2459	B2	3111	E3	3726	A5	7016	D2
2048	D3	2462	D2	3112	E3	3727	B5	7061	C5
2050	D4	2472	E1	3113	E3	3730	D6	7070	B5
2052	C3	2473	D1	3114	E3	3732	E6	7099	B3
2053	C4	2475	D1	3115	E2	3744	B5	7101	E2
2054	C4	2476	B2	3116	E2	3745	A5	7316	D5
2055	C3	2477	E1	3117	E2	3911	B6	7320	D5
2056	C3	2478	D1	3118	E2	3930	A6	7325	D4
2057	C3	2479	D1	3119	E2	3931	A6	7402	C3
2068	C5	2480	E1	3120	E2	3932	A6	7404	A1
2072	B4	2481	E1	3121	E2	3933	A6	7437	B3
2074	B4	2482	E1	3122	E2	3934	A6	7520	C1
2078	B3	2514	C1	3302	E5	3935	A6	7702	D6
2079	B5	2515	C1	3303	D5	3936	B6	7703	D6
2082	C5	2516	C1	3309	D5	3955	A1	7706	D6
2099	B4	2517	D1	3311	E5	3958	A1	7710	E6
2101	E4	2518	D1	3314	D5	4001	D2	7910	A5
2102	E3	2519	D1	3315	D5	4010	D3	7930	A6
2103	E4	2520	D1	3316	D5	4011	D3	7954	A1
2104	E4	2712	A5	3317	D5	4012	D3	S101	E3
2105	E3	2718	B5	3319	D6	4013	C4	S102	E3
2106	E3	2741	A5	3320	D5	4016	D3	S103	E3
2107	E3	2742	B4	3321	D4	4312	D5	S104	E3
2108	E3	2910	B5	3322	D4	4318	D5	S105	E2
2109	E3	2931	A6	3323	D4	4327	C4	S106	E3
2110	E3	2934	A6	3324	D4	4328	C4	S107	E3
2111	E3	2937	A4	3325	D4	4329	C4	S108	E3
2112	E3	2938	A4	3326	D4	4331	C4	S109	E3
2302	E5	2939	A5	3370	D4	4333	D4	S110	E3
2303	D5	2940	A5	3374	D4	4334	D4	S111	E2
2307	D5	2941	A5	3375	B4	4336	D4	S112	E2
2313	D5	2961	A1	3401	D3	4337	C5	S113	E2
2314	D5	3001	C6	3402	D3	4338	C5	S301	E4
2317	D5	3002	C6	3403	C2	4339	E5	S302	E4
2318	D5	3003	C6	3404	B1	4409	B3	S460	E1
2321	C4	3004	C6	3405	B1	4440	B3	S461	E1
2324	D4	3005	D3	3406	B1	4520	D1	S462	E1
2378	B3	3006	C3	3414	C3	4703	D6	S463	E1
2379	B3	3007	C4	3415	B2	4704	D6	S464	E1
2389	D4	3008	C4	3416	C2	5002	C5	S465	E1
2390	D3	3012	D3	3417	B1	5003	C4		
2394	C3	3014	D3	3418	B1	5004	D4		
2395	D4	3016	B3	3419	B1	5005	D3		
2402	C2	3019	D3	3420	B1	5006	C4		
2403	C2	3020	D3	3421	B1	5007	C4		
2404	C2	3021	D3	3422	B1	5008	B3		
2405	C2	3024	C4	3423	B1	5010	D3		
2406	C2	3031	D2	3429	B1	5011	D3		
2407	D1	3032	D2	3430	C3	5012	D3		
2408	C1	3033	D2	3431	C3	5013	C3		
2409	C1	3034	D2	3432	B3	5060	C5		
2410	C2	3035	C3	3433	B1	5070	B5		
2411	C2	3048	C4	3434	B1	5071	B5		
2412	C2	3049	D3	3435	D2	5309	D5		
2413	C2	3050	D3	3436	B3	5321	D4		
2414	C2	3051	D3	3439	B3	5324	D4		
2415	C2	3052	D3	3440	B3	5339	C5		
2416	C1	3054	C3	3441	C3	5340	D4		
2417	C2	3059	C4	3442	C3	5370	B3		
2418	C2	3060	C5	3443	C3	5371	B3		
2421	C2	3061	D3	3444	C3	5372	B4		
2422	C2	3064	C4	3463	D2	5401	C3		
2423	C1	3066	C5	3464	D2	5404	C3		
2424	C1	3067	B4	3468	D2	5462	D1		

Side AV Panel

SIDE AV

SVHS
1101
I104
I107
I106
I103
S107
3104 75R
6104 RES
S108
6106 RES
6103 RES
6105 RES
3105 75R
G_VID
3103 10R
RES 2115 47p
EMC 2102 47p
AV3_C_IN
A2
3101 10R
RES 2116 47p
EMC 2101 47p
AV3_CVBS_Y_IN
+3V3STBY
3125 1K0
3126 18K
7101 BC857B
2117 4u7
3127 18K
YELLOW 1102-1 1
CVBS
2
I108
S109
RES 6101
RES 6102
3106 75R
RED 1102-3 5
R
6
G_AUD_IN
I110
3107 1K0
3108 47K
2103 470p
AV3_R_IN
S103
WHITE 1102-2 3
L
4
I111
3109 1K0
3110 47K
2104 470p
AV3_L_IN
S104
I116
Screw Mounting Hole
1199 TYPE
EMC 2119 470p
EMC 2120 470p
G_AUD_OUT

SVHS AUDIO IN
1104
F101
F102
F109
3111 1K0
3112 1K0
I101
I102
S106
S105
3113 47K
2105 470p
3114 47K
2106 470p
G_UART_PC_AUD
A2
AV3_CVBS_Y_IN
AV3_C_IN
AV3_L_IN
AV3_R_IN
I112
I113
I114
I115
PC_AUDIO_L
PC_AUDIO_R
1108
G_VID
G_AUD_IN
FROM 1010 OF TV&SCALER
A 2

*4104
2111 10V 220u
2112 10V 220u
I117
I118
120R 3115
120R 3116
*4105
HEADPHONE
1106
F106
F107
F108
EMC 2113 470p
EMC 2114 470p
G_AUD_OUT

FROM 1704 OF AUD AMP
I (2 X 5W)
1107
L+
L-
GND
R+
R-
3121 0R
3122 0R
FOR ITV
F110
F112
F111
F113
1105
8 OHMS @ 5W
4 OHMS @ 2W
EMC 2107 1n0
EMC 2108 1n0
EMC 2109 1n0
EMC 2110 1n0
*4106
*4107
*4108
*4103
*4102
I716

*	2 x 2W	2 x 5W
4102	Y	N
4103	Y	N
4104	Y	N
4105	Y	N
4106	N	Y
4107	N	Y
4108	Y	N

FROM 1701 OF TV&SCALER
A 4 (2 X 2W)
1110
L
GND
R

FROM 1401 OF TV&SCALER
A 7 +3V3STBY
1111
JTAG_SCL_UART_TX
JTAG_SCL_UART_RX
3123 100R
3124 100R
F105
RES 6107
RES 6108
BAV99
G_UART_PC_AUD
S101
S102
BZX384-C4V7
6109
6110
6111
6112
1112
FOR SERVICE UART

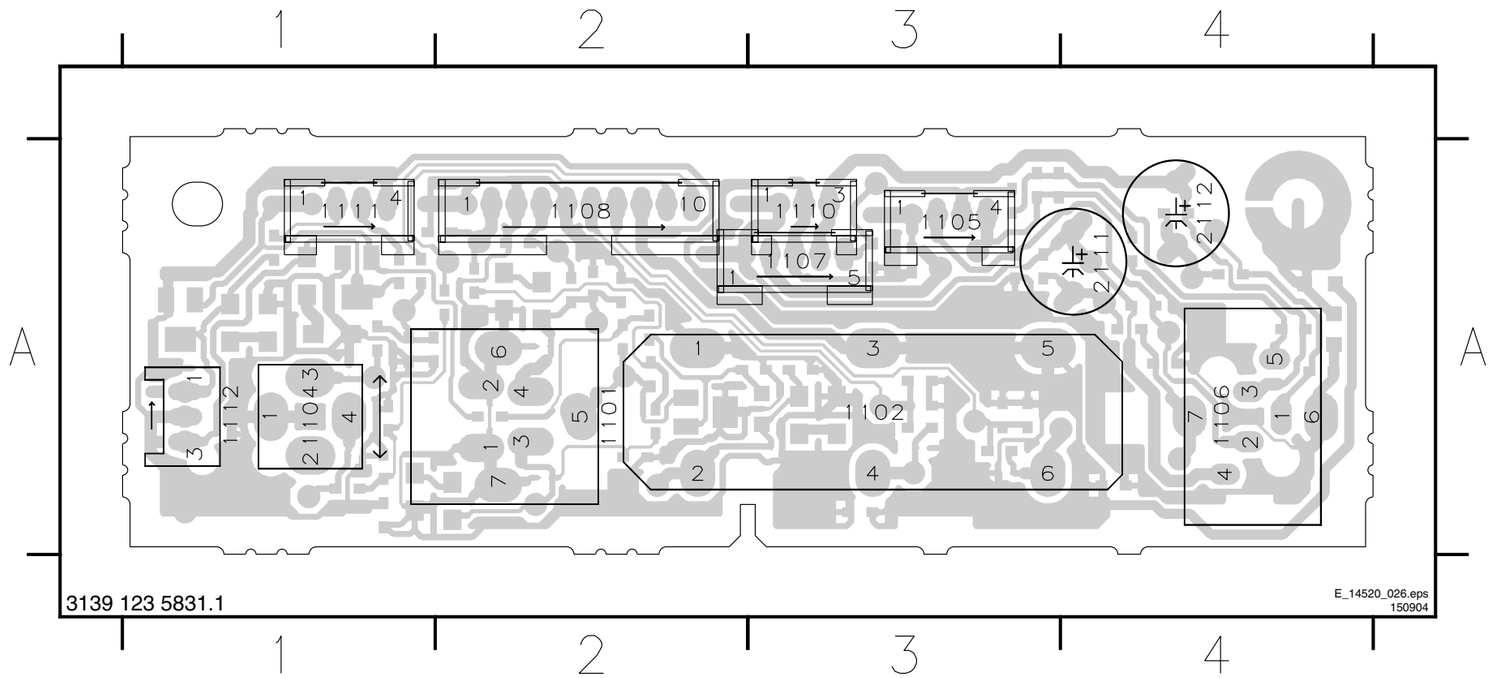
EMC 2118 1n0
EMC 4109
EMC 4110

3139 123 5831.1
E_14520_025.eps
150904

1101 A1	7101 C1
1102-1 D1	F101 A5
1102-2 E1	F102 A5
1102-3 E1	F105 F5
1104 A4	F106 B8
1105 D8	F107 B8
1106 B8	F108 B8
1107 D4	F109 B5
1108 A8	F110 D7
1110 E4	F111 D7
1111 E4	F112 D7
1112 F7	F113 D7
1199 F1	I101 A7
2101 B3	I102 A6
2102 A3	I103 C1
2103 E3	I104 B1
2104 F3	I106 B2
2105 A7	I107 B1
2106 A7	I108 D2
2107 D7	I110 E2
2108 D7	I111 E2
2109 D7	I112 A8
2110 D7	I113 A8
2111 B5	I114 A8
2112 B5	I115 A8
2113 C7	I116 F3
2114 C7	I117 B6
2115 A2	I118 B6
2116 B2	I716 D8
2117 C2	S101 F6
2118 E8	S102 F6
2119 F1	S103 E1
2120 F1	S104 F1
3101 B3	S105 B5
3103 A3	S106 B5
3104 B1	S107 B1
3105 B2	S108 B2
3106 D3	S109 D1
3107 E2	
3108 E3	
3109 E2	
3110 F3	
3111 A6	
3112 A6	
3113 A6	
3114 A7	
3115 B6	
3116 B6	
3121 C5	
3122 C5	
3123 F5	
3124 F5	
3125 C2	
3126 C2	
3127 D2	
4102 D8	
4103 D8	
4104 B5	
4105 C5	
4106 C8	
4107 C8	
4108 C8	
4109 F8	
4110 F8	
6101 D2	
6102 D2	
6103 B2	
6104 B1	
6105 B2	
6106 B2	
6107 E6	
6108 E7	
6109 F6	
6110 F6	
6111 F7	
6112 F7	

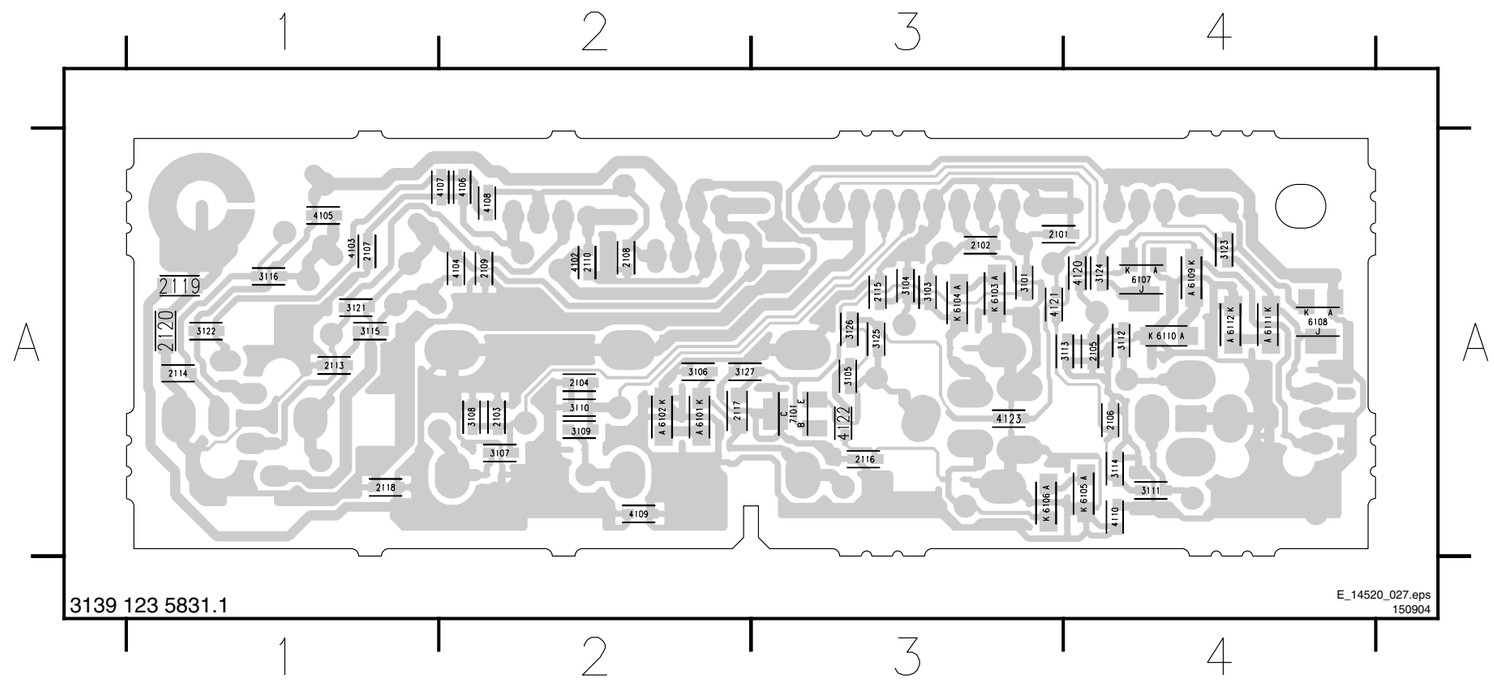
Layout Side AV Panel (Top Side)

1101 A2
1102 A3
1104 A1
1105 A3
1106 A4
1107 A3
1108 A4
1110 A3
1111 A1
1112 A1
2111 A4
2112 A4

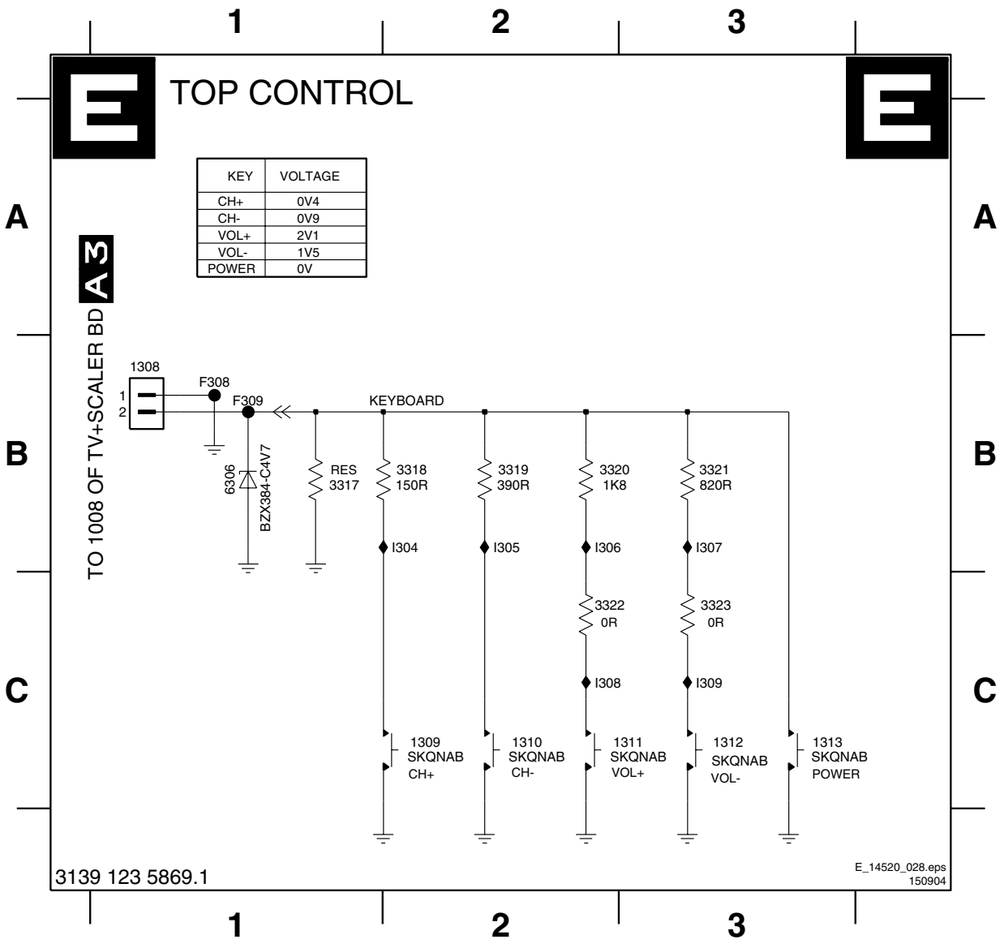


Layout Side AV Panel (Bottom Side)

2101 A3
2102 A3
2103 A2
2104 A2
2105 A4
2106 A4
2107 A1
2108 A2
2109 A2
2110 A2
2113 A1
2114 A1
2115 A3
2116 A3
2117 A2
2118 A1
2119 A1
2120 A1
3101 A3
3103 A3
3104 A3
3105 A3
3106 A2
3107 A2
3108 A2
3109 A2
3110 A2
3111 A4
3112 A4
3113 A4
3114 A4
3115 A1
3116 A1
3121 A3
3122 A1
3123 A2
3124 A4
3125 A3
3126 A2
3127 A2
4102 A2
4103 A1
4104 A2
4105 A1
4106 A2
4107 A2
4108 A2
4109 A2
4110 A4
4120 A4
4121 A3
4122 A3
4123 A4
6101 A2
6102 A2
6103 A3
6104 A4
6105 A4
6106 A3
6107 A4
6108 A4
6109 A4
6110 A4
6111 A4
6112 A4
7101 A3

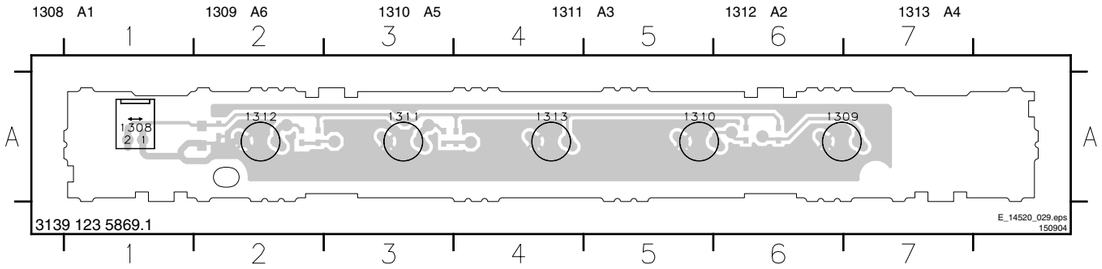


Top Control Panel

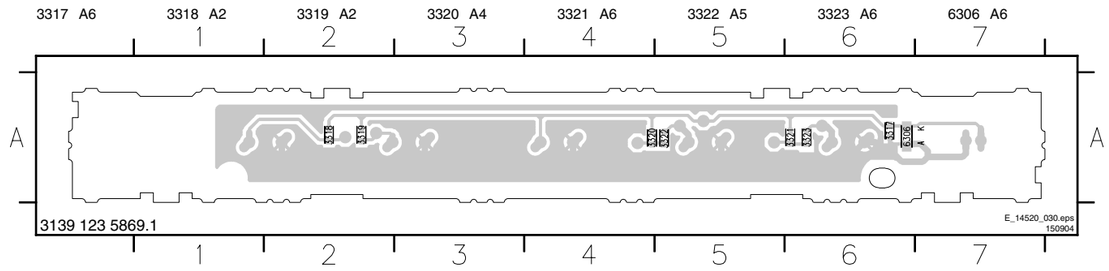


1308 B1
1309 C2
1310 C2
1311 C3
1312 C3
1313 C3
3317 B1
3318 B2
3319 B2
3320 B2
3321 B3
3322 C2
3323 C3
6306 B1
F308 B1
F309 B1
I304 B2
I305 B2
I306 B2
I307 B3
I308 C2
I309 C3

Layout Top Control Panel (Top Side)

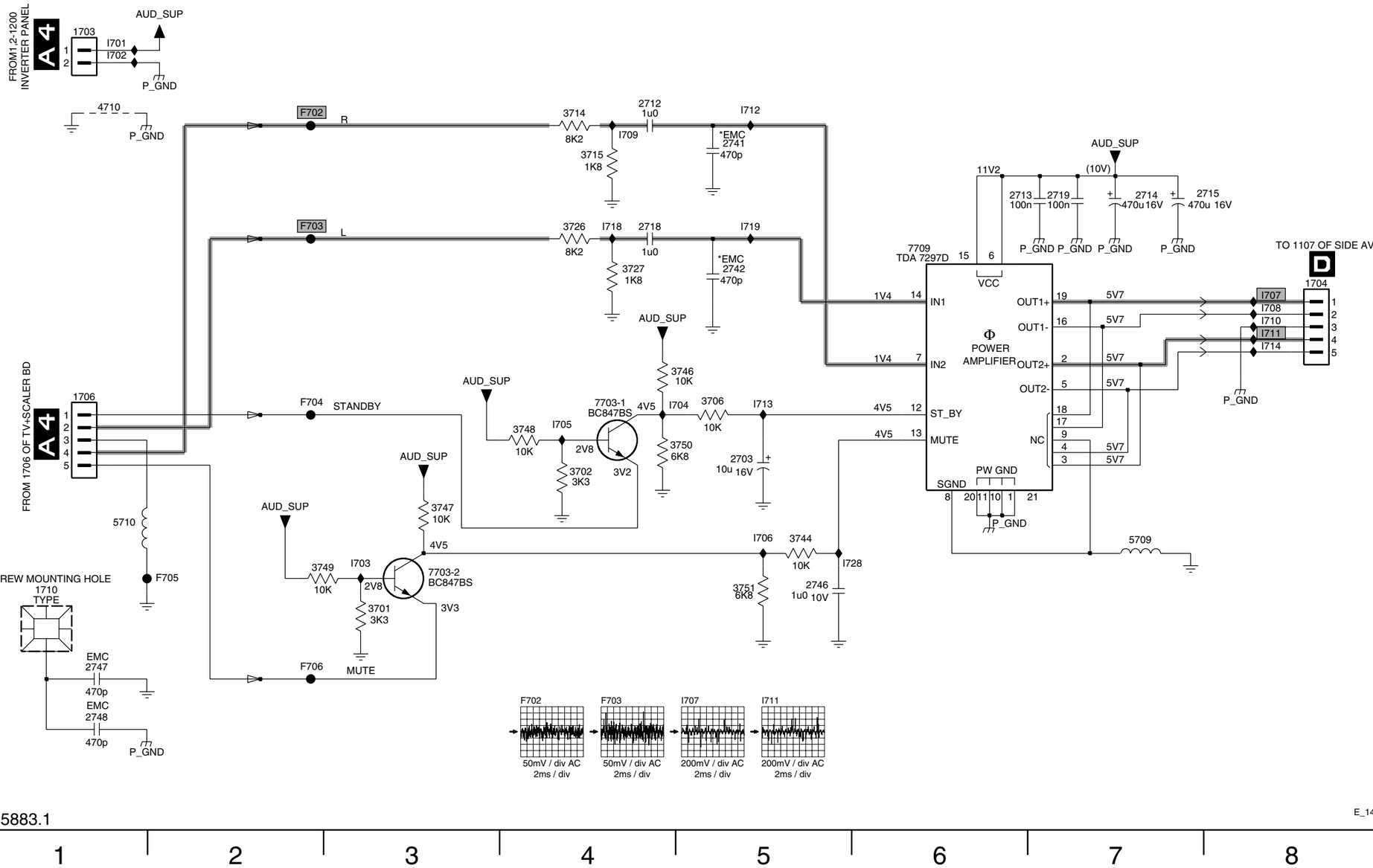


Layout Top Control Panel (Bottom Side)



Audio Amplifier (2x5W) (20 & 23 inch)

AUDIO AMPLIFIER (2x5W) (FOR 20 & 23 INCH)

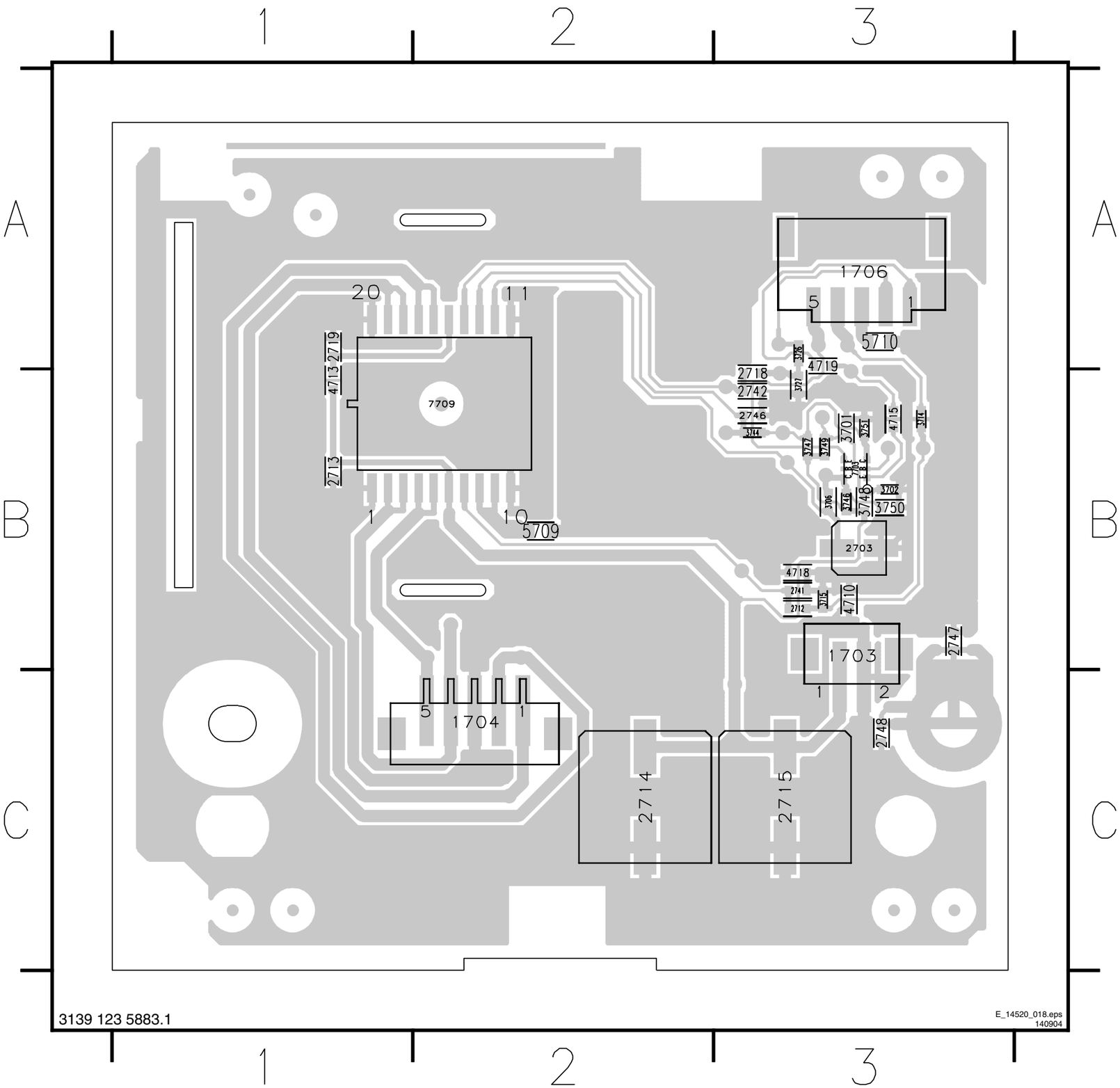


3139 123 5883.1

E_14520_017.eps
240904

1703 A1
1704 C8
1706 D1
1710 E1
2703 D5
2712 B4
2713 B6
2714 B7
2715 B8
2718 C4
2719 B7
2741 B5
2742 C5
2746 E5
2747 E1
2748 E1
3701 E3
3702 D4
3706 D5
3714 B4
3715 B4
3726 C4
3727 C4
3744 D5
3746 C5
3747 D3
3748 D4
3749 E2
3750 D5
3751 E5
4710 B1
5709 D7
5710 D1
7703-1 D4
7703-2 E3
7709 C6
F702 B2
F703 C2
F704 D2
F705 E2
F706 E2
I701 B1
I702 B1
I703 D3
I704 D5
I705 D4
I706 D5
I707 C8
I708 C8
I709 B4
I710 C8
I711 C8
I712 B5
I713 D5
I714 C8
I718 C4
I719 C5
I728 D6

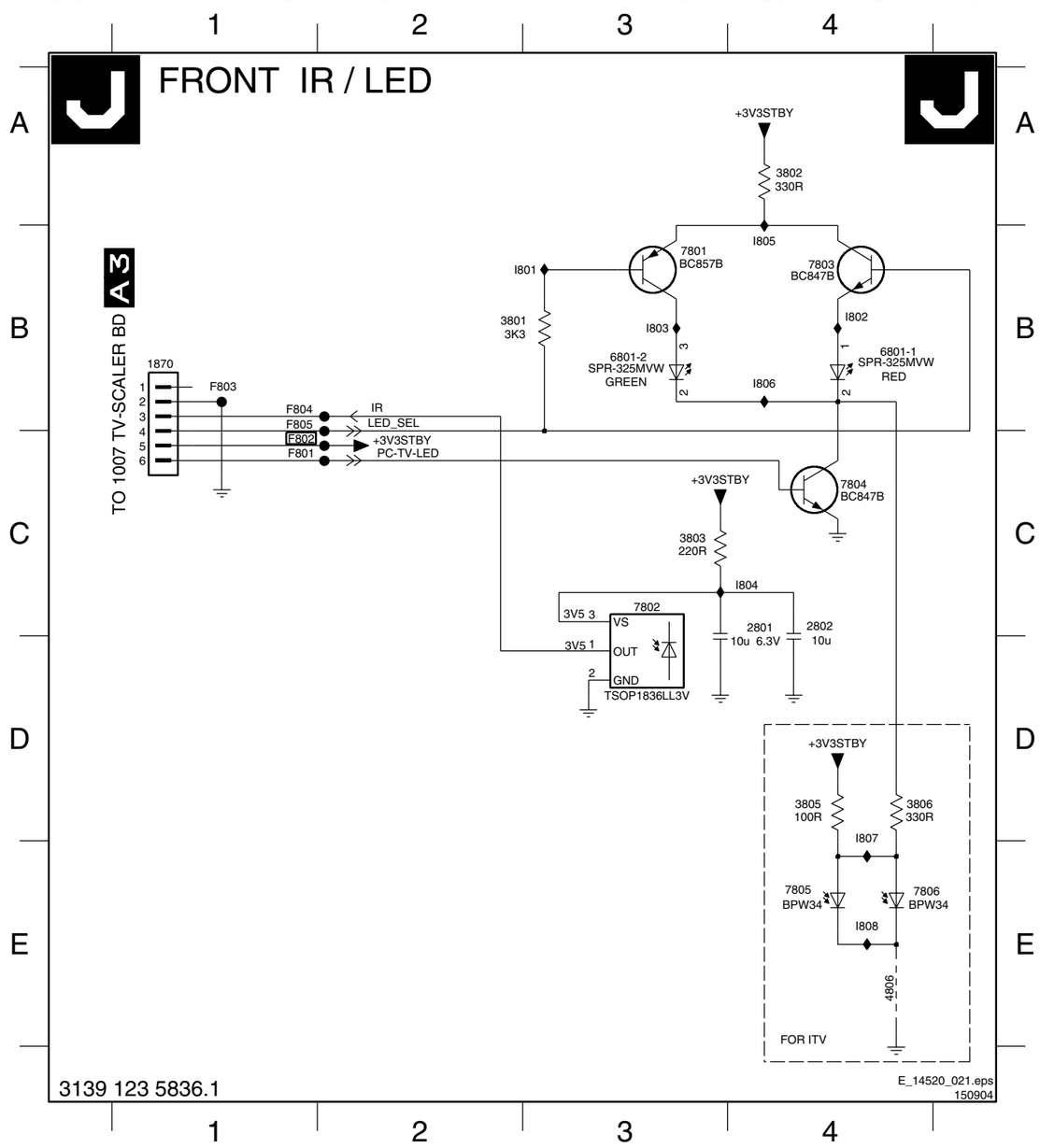
Audio Amplifier (2x5W) (20 & 23 inch)



1703 B3
1704 C2
1706 A3
2703 B3
2712 B3
2713 B1
2714 C2
2715 C3
2718 B3
2719 A1
2741 B3
2742 B3
2746 B3
2747 B3
2748 C3
3701 B3
3702 B3
3706 B3
3714 B3
3715 B3
3726 A3
3727 B3
3744 B3
3746 B3
3747 B3
3748 B3
3749 B3
3750 B3
3751 B3
4710 B3
4713 B1
4715 B3
4718 B3
4719 A3
5709 B2
5710 A3
7703 B3
7709 B2

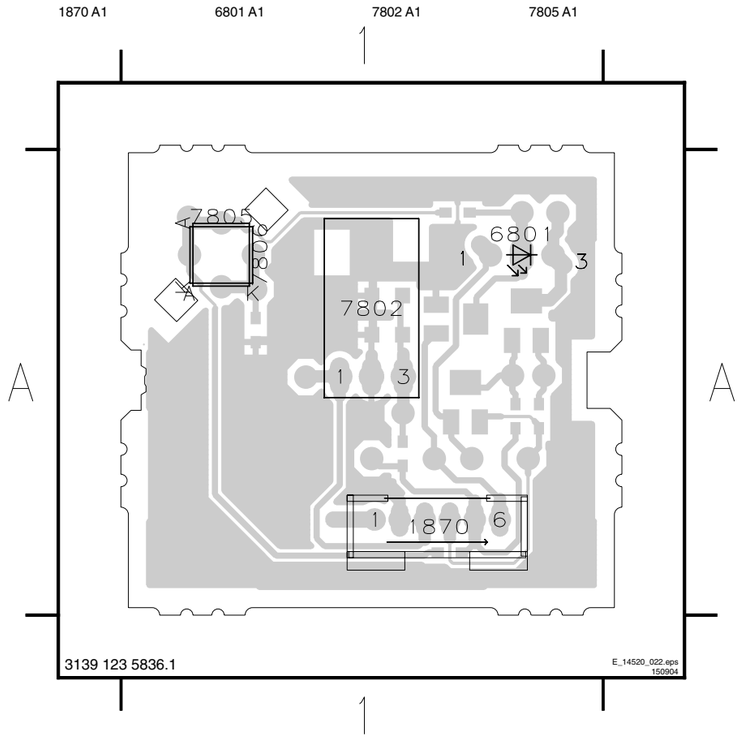
Front IR / LED Panel

1870 B1 3801 B3 3805 D4 6801-1 B4 7802 C3 7805 E4 F802 C1 F805 B1 I803 B3 I806 B4
2801 C4 3802 A4 3806 D4 6801-2 B3 7803 B4 7806 E4 F803 B1 I801 B3 I804 C4 I807 D4
2802 C4 3803 C3 4806 E4 7801 B3 7804 C4 F801 C1 F804 B1 I802 B4 I805 B4 I808 E4



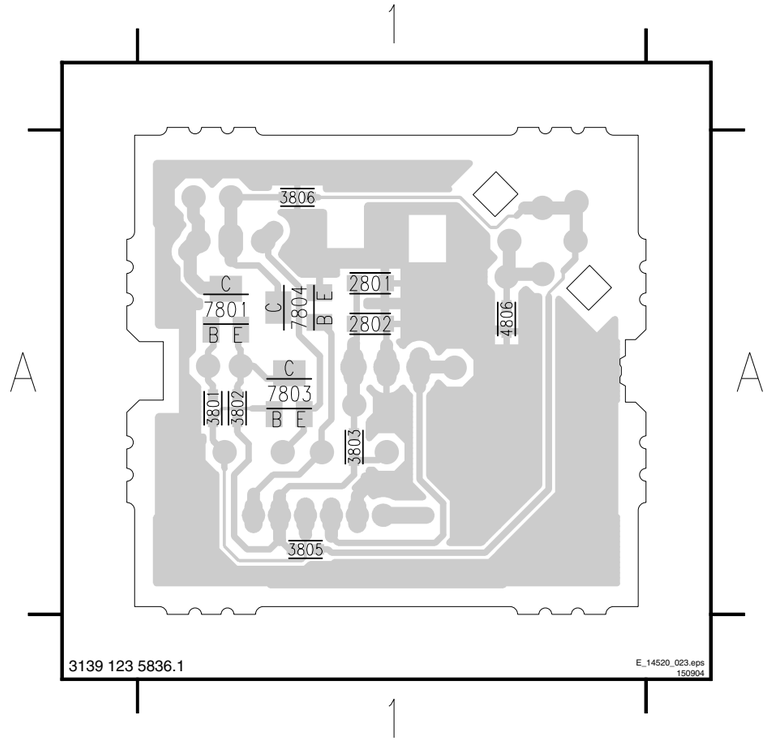
Layout Front IR / LED Panel (Top Side)

1870 A1 6801 A1 7802 A1 7805 A1



Layout Front IR / LED Panel (Bottom Side)

2801 A1 3801 A1 3803 A1 3806 A1 7801 A1 7804 A1
2802 A1 3802 A1 3805 A1 4806 A1 7803 A1



Personal Notes:

E_06532_013.eps
060804

8. Alignments

General: The Service Default Mode (SDM) and Service Alignment Mode (SAM) are described in chapter 5. Menu navigation is done with the cursor Up, Down, Left or Right keys of the remote control transmitter.

8.1 General Alignment Conditions

Perform all electrical adjustments under the following conditions:
Mains voltage and frequency: 100-240 V / 50/60 Hz.
Allow the set to warm up for approximately 10 minutes.
Test probe: Ri > 10 M ohm; Ci < 2.5 pF.

8.3.1 SAM Menu

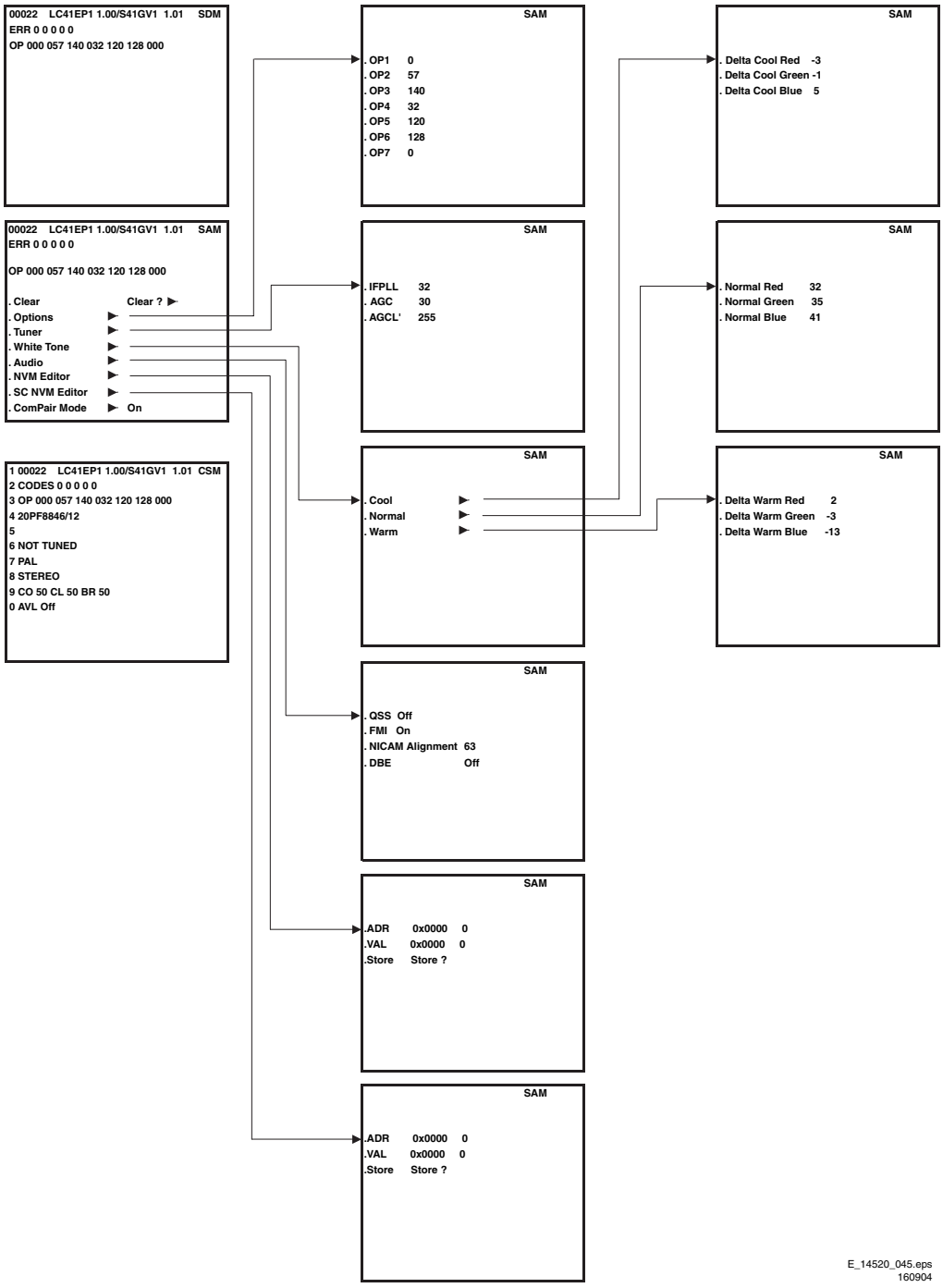


Figure 8-1 SAM Menu

8.2 Hardware Alignments

There are no hardware alignments foreseen for the LCD-TV.

8.3 Software Alignments

With the software alignments of the Service Alignment Mode (SAM) the geometry, white tone and tuner (IF) can be aligned. To store the data: Use the RC button Menu to switch to the main menu and next, switch to 'Stand-by' mode.

8.3.2 White Tone

In the White Tone sub menu the colour values for the colour temperature values can be changed.
The colour temperature mode (Normal, Delta Cool, Delta Warm) or the colour (R, G, B) can be selected with the Right/ Left cursor keys. The mode or value can be changed with the Up/Down cursor keys.
First the values for the Normal colour temperature should be selected. Range: 0-255, 128 represent the middle of the value (no offset difference). Then the offset values for the Delta Cool and Delta Warm mode can be selected. Note that the alignment values are non-linear. The range is: -50 to +50, 0 represents the middle value, (no offset difference).

Input signal strength: >=10 mV rms (80 dBµV) terminal voltage.
Input injection point: Aerial input.

Alignment Method

Initial Set-up
- 12 minutes soaking time before carrying out Colour Temp alignment.
- Incredible Picture/Contrast+ and Active Control & Light Sensor must be switched Off for proper tracking.
- Set all colour temperature settings to their initial values, i.e. Red=185; Green=180; Blue=193.
- The offset values for Cool & Warm should be preloaded into NVM.
- The alignment is done for Normal only.

Method of alignments
1. Place the colour sensor of the meter at the centre of the screen with standard orientation (at 0 degree orientation).
2. Set the meter in (T, delta UV, Y) mode.
3. Set Brightness and Colour to nominal (Factory mode, Brightness 60).
4. Set Colour temp to normal.
5. Set Contrast to make the light output Y on the meter 250 nit +/-10%.
6. Set Green=128.
7. Adjust Red and Blue to bring delta UV and T to the value as in the table.
8. Repeat the procedure if necessary to obtain the values as in the table.

Expected Results
- Measured parameters: Refer to table,
- Specifications: Refer to table,
- Units of measurement: Kelvin.

Table 8-1 Colour temperatures

Colour temp.	NORMAL		COOL		WARM	
	T (K)	∆UV	T (K)	∆UV	T (K)	∆UV
EUROPE	8500	-003	11500	-005	7000	-005
Tolerance	+/-10%	+/-003	+/-10%	+/-003	+/-10%	+/-003

8.3.3 Tuner Adjustment

AGC (RF AGC Take Over Point)
Set pattern generator (e.g. PM5580) with colour bar pattern and connect to aerial input with RF signal amplitude - 10mV and set frequency for PAL/SECAM to 475.25 MHz. For France select the L'-signal.
- Activate the SAM-menu. Go to the sub-menu Tuner, select the sub-menu option AFC Window and adjust the value to 100kHz.
- Select the AGC sub-menu.
- Connect a DC multi-meter to F306 pin1 of the tuner.
- Adjust the AGC until the voltage at pin 1 of the tuner is 3.3 Volts +0.5 / -1.0.
- The value can be incremented or decremented by pressing the right/left Menu-button on the RC.
- Switch the set to standby to store the data.

8.3.4 Grey Scale Adjustment

SDTV Grey Scale Adjustment

Equipment and setting
- E.g. Fluke 54200 or Philips PM5580.
- 100% "8-step grey scale" pattern.

Alignment Method
- Switch with the RC to TV mode,
- Press the MUTE button on RC,
- Set SMART PICTURE to SOFT mode,
- Activate the auto colour function by pressing key-sequence:
  "INFO - MUTE - MUTE - MUTE - INFO - MENU - INFO".

Expected Results
- Visual check if the 8 Grey levels are correct.

Analog PC Grey Scale Adjustment

Equipment and setting
- Quantum Data 802B.
- PC input signal, with 64 levels Grey scale pattern, 1024x768 @ 60Hz (Format= 81:DMT1060, Pattern= 123:Grey 64).
- PC input at D-sub VGA connector.

Alignment Method
- Switch with the RC to PC mode.
- Press the MUTE button on RC.
- Set BRIGHTNESS and CONTRAST to nominal "50".
- Activate the auto colour function by pressing key-sequence:
  "INFO - MUTE - MUTE - MUTE - INFO - MENU - INFO".

Expected Results
- Visual check if the 64 Grey levels are correct.

HD Grey Scale Adjustment

Equipment and setting
- Quantum Data 802B.
- HD input signal, Top half 100% colour bar and bottom half Grey scale pattern,1920x1080i@60Hz YPbPr (Format= 1080i30, Pattern= HDBar100).
- HD input at D-sub VGA connector.

Alignment Method
- Switch with the RC to HD mode.
- Press the MUTE button on RC.
- Activate the auto colour function by pressing key-sequence:
  "INFO - MUTE - MUTE - MUTE - INFO - MENU - INFO".

Expected Results
- Visual check if Colour bar tint and Grey scale is correct.

8.3.5 Sound

No adjustments needed for sound.

The default values for the audio alignments are:
- QSS: On
- FMI: Off
- NICAM Alignment: 63
- Lip Sync: Off
- DBE: Off

8.3.6 Options

Options are used to control the presence/absence of certain features and hardware.

How to change an Option Byte
An Option Byte represents a number of different options. Changing these bytes directly makes it possible to set all options very fast. All options are controlled via seven option bytes. Select the option byte (OP1.. OP7) with the cursor UP/ DOWN keys, and enter the new value.

Leaving the OPTION sub menu saves the changes in the Option Byte settings. Some changes will only take effect after the set has been switched “off” and “on” with the AC power switch (cold start).

Table 8-2 Option codes (general overview for all displays)

Bit (DEC)	Option	Description	23PF8946	20PF7846	20PF8846	17PF8946	15PF8946	14PF7846
7 (128)	OP_PHILIPS_TUNER	Philips Tuner available	1	1	1	1	1	1
6 (64)	OP_FM_RADIO	FM Radio available	1	1	1	1	1	1
5 (32)	OP_LNA	Low Noise Amplifier available	0	0	0	0	0	0
4 (16)	OP_ATS	Auto Tuning System	1	1	1	1	1	1
3 (8)	OP_ACI	ACI	1	1	1	1	1	1
2 (4)	OP_UK_PNP	Activate Plug & Play menu at start-up	0	0	0	0	0	0
1 (2)	OP_VIRGIN_MODE	After virgin = English + Great Britain	0	0	0	0	0	0
0 (1)	OP_CHINA	AP-PAL tuning algorithm for China	0	0	0	0	0	0
OP1 (DEC):			**216**	**216**	**216**	**216**	**216**	**216**
OP1 (HEX):			**D8**	**D8**	**D8**	**D8**	**D8**	**D8**
7 (128)	OP_SC	Not used	0	0	0	0	0	0
6 (64)	OP_UI_GREEN	UI for Magnavox sets (NAFTA)	0	0	0	0	0	0
5 (32)	OP_CHANNEL_NAMING	Naming of channel feature available	0	0	0	0	0	0
4 (16)	OP_LTI	Histogr. algorithm available (TDA9178)	0	0	0	0	0	0
3 (8)	OP_TILT	Picture Rotation available	0	0	0	0	0	0
2 (4)	OP_FINE_TUNING	Fine Tuning algorithm available	1	1	1	1	1	1
1 (2)	OP_PIP_PHILIPS_TUNER	PIP Philips tuner	0	0	0	0	0	0
0 (1)	OP_HUE	Tint for NTSC transmission	0	0	0	0	0	0
OP2 (DEC):			**4**	**4**	**4**	**4**	**4**	**4**
OP2 (HEX):			**04**	**04**	**04**	**04**	**04**	**04**
7 (128)	OP_EW_FUNCTION	Geometry adj. for Large screen sets	1	1	1	1	1	1
6 (64)	OP_2TUNER_PIP	Double Tuner for PIP available	0	0	0	0	0	0
5 (32)	OP_PIP_SPLITTER	Not used	0	0	0	0	0	0
4 (16)	OP_SPLITTER	Not used	0	0	0	0	0	0
3 (8)	OP_VIRTUAL_DOLBY	Virtual Dolby Effect	1	1	1	1	1	1
2 (4)	OP_WIDE_SCREEN	16:9 sets	1	0	0	1	0	0
1 (2)	OP_WSSB	Wide Screen Signalling Bit detection	1	0	0	1	0	0
0 (1)	OP_ECO_SUBWOOFER	Sub woofer available	0	0	0	0	0	0
OP3 (DEC):			**142**	**136**	**136**	**142**	**136**	**136**
OP3 (HEX):			**8E**	**88**	**88**	**8E**	**88**	**88**
7 (128)	OP_PC_MODE	VGA input available	1	0	0	1	1	0
6 (64)	OP_HD	Not used	0	0	0	0	0	0
5 (32)	OP_ULTRA_BASS	Ultra Bass Boost available	0	0	0	0	0	0
4 (16)	OP_DELTA_VOLUME	Delta Volume feature available	1	1	1	1	1	1
3 (8)	OP_TAIWAN_KOREA	Not used	0	0	0	0	0	0
2 (4)	OP_VOLUME_LIMITER	Not used	0	0	0	0	0	0
1 (2)	OP_STEREO_DBX	Stereo DBX for NTSC available	0	0	0	0	0	0
0 (1)	OP_STEREO_NICAM_2CS	Stereo NICAM 2CS available	1	1	1	1	1	1
OP4 (DEC):			**145**	**17**	**17**	**145**	**145**	**17**
OP4 (HEX):			**91**	**11**	**11**	**91**	**91**	**11**
7 (128)	OP_AV1	External Source 1 available	1	1	1	1	1	1
6 (64)	OP_AV2	External Source 2 available	0	0	0	0	0	0
5 (32)	OP_AV3	External Source 3 (Side AV) available	1	1	1	1	1	1
4 (16)	OP_CVI	Component Video In available	0	0	0	0	0	0
3 (8)	OP_SVHS2	Super Video Home System 2 available	0	0	0	0	0	0
2 (4)	OP_SVHS3	Super Video Home System 3 available	1	1	1	1	1	1
1 (2)	OP_HOTEL_MODE	LATAM specific simplified Hotel Mode	0	0	0	0	0	0
0 (1)	OP_SIMPLY FACTORY	Not used	0	0	0	0	0	0
OP5 (DEC):			**164**	**164**	**164**	**164**	**164**	**164**
OP5 (HEX):			**A4**	**A4**	**A4**	**A4**	**A4**	**A4**
7 (128)	OP_PERSONAL_ZAPPING	Zapping of channels feature available	0	0	0	0	0	0
6 (64)	OP_SMART_SURF	Surf List available	0	0	0	0	0	0
5 (32)	OP_FMTRAP	FM trap available	0	0	0	0	0	0
4 (16)	OP_COMBFILTER	comb filter available	1	1	1	1	1	1
3 (8)	OP_ACTIVE_CONTROL	Auto Picture Impr. feature available	0	0	0	0	0	0
2 (4)	OP_VIDEO_TEXT	Not used	0	0	0	0	0	0
1 (2)	OP_LIGHT_SENSOR	Light Sensor enabled	0	0	0	0	0	0
0 (1)	OP_TWIN_TEXT	2 txt pages on screen available	0	0	0	0	0	0
OP6 (DEC):			**16**	**16**	**16**	**16**	**16**	**16**
OP6 (HEX):			**10**	**10**	**10**	**10**	**10**	**10**
7 (128)	OP_TIME_WIN1	1= 5 s, 0= 2 s (Europe fixed 1.2 s)	0	0	0	0	0	0
6 (64)	OP_MALAY	Not used	0	0	0	0	0	0
5 (32)	OP_THAI	Not used	0	0	0	0	0	0
4 (16)	OP_3D_COMBFILTER	3D comb filter available	0	0	0	0	0	0
3 (8)	OP_DUMMY6	Not used	0	0	0	0	0	0
2 (4)	OP_DUMMY7	Not used	0	0	0	0	0	0
/12								
1 (2)	OP_WEST_EU	West Europe Set (0 - East Europe Set) by default "on"	1	1	1	1	1	1
0 (1)	OP_MULTI_STANDARD_EUR	For Europe multi standard set	1	1	1	1	1	1
/58								
1 (2)	OP_WEST_EU	West Europe Set (0 - East Europe Set) by default "on"	0	0	0	0	0	0
0 (1)	OP_MULIT_STANDARD_EUR	For Europe multi standard set	1	1	1	1	1	1
OP7 (DEC):			**1/3**	**1/3**	**1/3**	**1/3**	**1/3**	**1/3**
OP7 (HEX):			**01/03**	**01/03**	**01/03**	**01/03**	**01/03**	**01/03**

9. Circuit Descriptions, Abbreviation List, and IC Data Sheets

Index of this chapter
1. Introduction
2. Block Diagram
3. Power Supply
4. Input/Output
5. Tuner and IF
6. Video: TV Part
7. Video: Scaler Part
8. Audio Processing
9. Control
10. LCD Display
11. Abbreviation List
12. IC Data Sheets

9.1 Introduction

The LC4.1 LCD TV is a global LCD TV for the year 2004. It is the successor of the LC13 LCD TV and covers screens sizes 14, 15, 17, 20 and 23 inch (in both 4:3 and 16:9 ratio) with SP2 and ARCH3 styling.
This chassis has the following (new) features:

- **Audio**: The sound processor is part of the UOC processor (called “Hercules”). The chassis has a FM Radio with 40 preset channels.
- **Video**: Enhanced video features, video drivers and Active Control.

The architecture consists of a TV and Scaler panel with I/O, Side I/O panel, Sound Amplifier Panel, Top Control Panel and Power Supply panel.
The functions for video/audio processing, microprocessor (P), and CC/Teletext (TXT) decoder are all combined in one IC (TDA120xx, item 7011), the so-called third generation Ultimate One Chip (UOC-III) or “Hercules”. This chip has the following features:

- Control, small signal, mono/stereo, and extensive Audio/ Video switching in one IC.
- Upgrade with digital sound & video processing.
- Alignment free IF, including SECAM-L/L1 and AM.
- FM sound 4.5/5.5/6.0/6.5, no traps/bandpass filters.
- Full multi-standard color decoder.
- One Xtal reference for all functions (microprocessor, RCP, TXT/CC, RDS, color decoder, and stereo sound processor).

9.2 Block Diagram

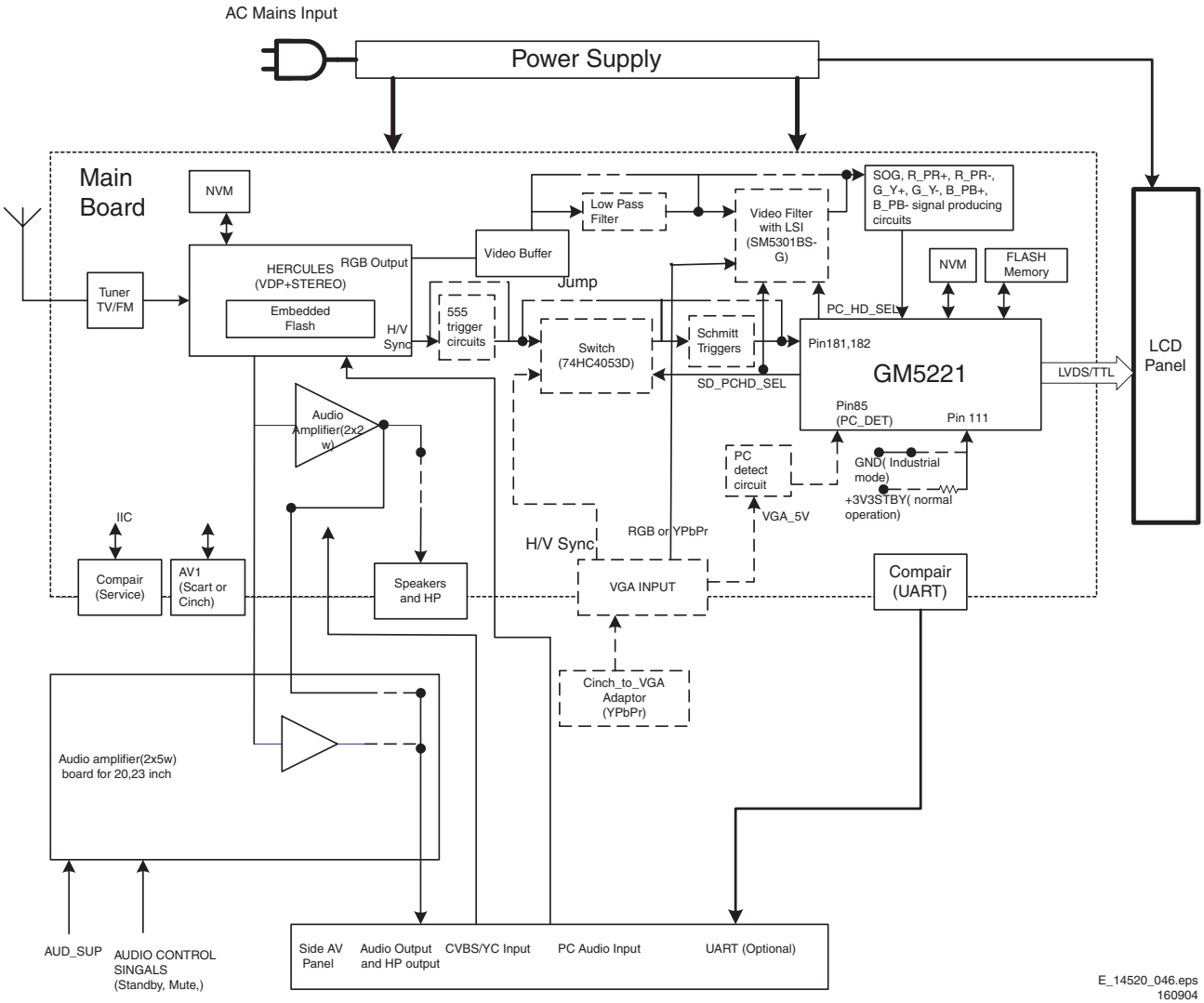


Figure 9-1 Block Diagram LC4.1

The PLL tuner UR1316 (with FM radio) delivers the IF-signal, via audio & video SAW-filters, to the Video Signal Processor and FLASH embedded TEXT/Control/Graphics Micro Controller TDA120x1 (item 7011, also called Hercules). This IC has the following functions:

- Analogue Video Processing
- Sound Demodulation
- Audio Interfaces and switching
- Volume and tone control for loudspeakers
- Reflection and delay for loudspeaker channels
- Micro Controller
- Data Capture
- Display

The Hercules has one input for the internal CVBS signal and a video switch with 3 external CVBS inputs and a CVBS output. All CVBS inputs can be used as Y-input for Y/C signals. However, only 2 Y/C sources can be selected because the circuit has 2 chroma inputs. It is possible to add an additional CVBS(Y)/C input (CVBS/YX and CX) when the YUV interface and the RGB/YPRPB input are not needed. One SCART-connector is used (SCART1). This connector is fully equipped. The video part delivers the RGB signals to the Scaler IC.

The Genesis GM5221 Scaler IC receives either the SDTV video input signals from the Hercules or the PC input signal from an external computer. Switching between the two signals is done via the SD/HD selection IC (7461).
After the video processing done by the Scaler, the digital data is sent via a Low Voltage Differential Signalling bus to the LCD panel. LVDS is used to improve data speed and to reduce EMI significantly.
There are two I2C lines and two interrupt and communication lines (TV_IRQ and TV_SC_COM) for the Scaler control. The Scaler communicates with the Hercules as a slave device. To avoid buffer overflow at the Scaler side, the TV_SC_COM line provides the necessary hardware flow control. To allow bi-directional communication, the Scaler can initiate a service interrupt-request to the Hercules via the TV_IRQ line.

The Hercules, and EEPROM are supplied with 3.3 V, which is also present during STANDBY.
The EEPROM, or NVM (Non Volatile Memory) is used to store the settings.

The sound part is built up around the Hercules. The Source Selection, Decoding and Processing are all done by the Hercules.

Power supply input are several DC voltages coming from a supply panel.

9.3 Power Supply

For Service, this supply panel is a black box. When defect (this can be traced via the fault-finding tips, or by strange phenomena), a new panel must be ordered (see table below for ordering codes), and after receipt, the defective panel must be send for repair.

Table 9-1 Ordering Codes Power Supply

Screen size (inches)	Ordering Code
14	3341 101 20010
15	3341 101 20020
17	3122 137 23040
20	3122 137 23100
23	3122 137 23070

9.4 Input/Output

The I/O is divided over two parts: Rear I/O and Side I/O. The rear I/O is integrated in the TV & Scaler board.

Table 9-2 I/O Connectivity

Screen size (inches)	Rear I/O		Side I/O			
	Scart	VGA	Y/C	CVBS + L/R	HP	PC Audio
14	X		X	X	X	
15	X	X	X	X	X	X
17	X	X	X	X	X	X
20	X		X	X		
23	X	X	X	X	X	X

9.5 Tuner and IF

A Philips UR13xx Tuner with second input (for FM Radio) is used in the TV board. The SIF and FM signals are decoded by the Hercules. Tuning is done via I2C.

9.5.1 Video IF amplifier

The IF-filter is integrated in a SAW (Surface Acoustic Wave) filter. One for filtering IF-video (1328) and one for IF-audio (1330). The type of these filters is depending of the standard(s) that has to be received.

The output of the tuner is controlled via an IF-amplifier with AGC-control. This is a voltage feedback from pin 31 of the Hercules to pin 1 of the tuner. The AGC-detector operates on top sync and top white level. AGC take-over point is adjusted via the service alignment mode 'Tuner' - 'AGC'. If there is too much noise in the picture, then it could be that the AGC setting is wrong. The AGC-setting could also be mis-aligned if the picture deforms with perfect signal; the IF-amplifier amplifies too much.

9.6 Video: TV Part (diagrams A1, A2, and A3)

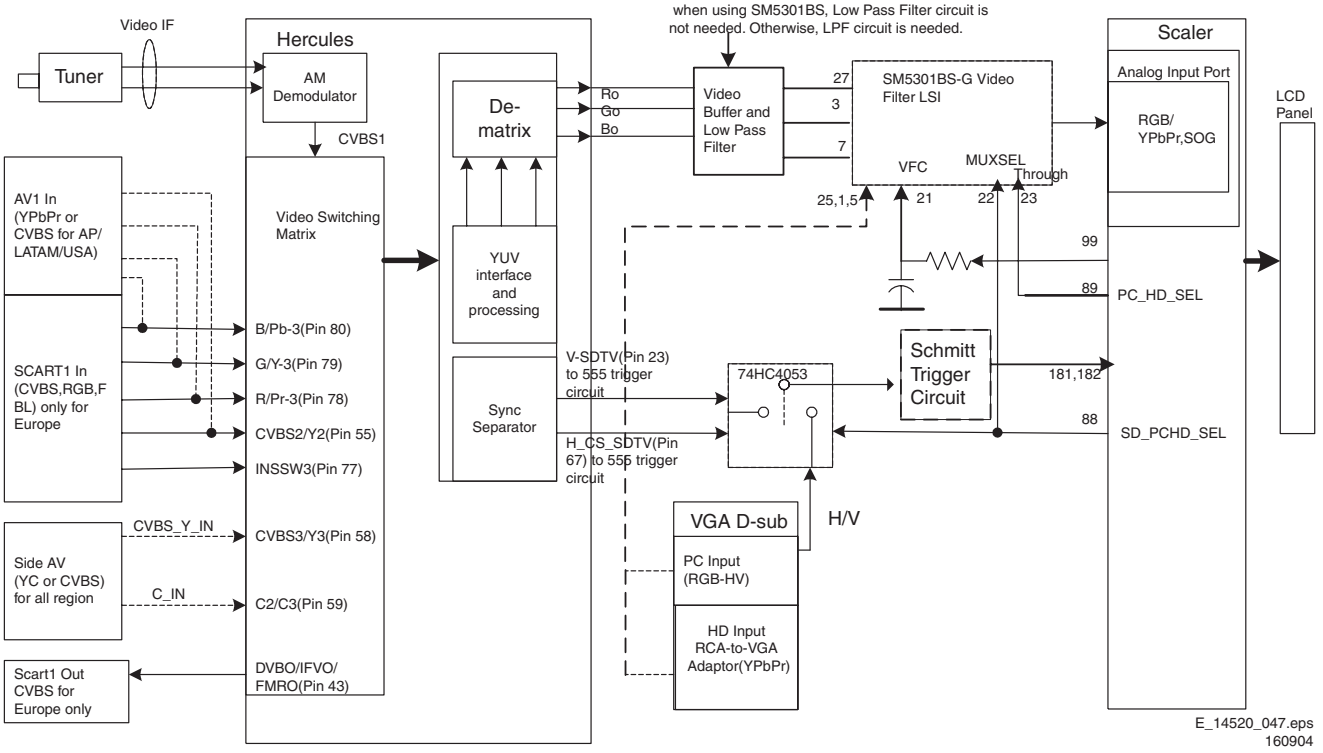


Figure 9-2 Block diagram video processing

The video processing is completely handled by the Hercules

- IF demodulator.
- Chrominance decoder
- Sync separator.
- Horizontal & vertical drive.
- RGB processing.
- CVBS and SVHS source select.

It has also build in features like:

- CTI.
- Black stretch.
- Blue stretch.
- White stretch.
- Slow start up.
- Dynamic skin tone correction etc.

Further, it also incorporates sound IF traps and filters, and requires only one crystal for all systems.

9.7 Video: Scaler Part (diagram A6, A7, and A8)

The Genesis gm5221 Scaler is an all-in-one graphics and video processing IC for LCD monitors and televisions with up to XGA output resolutions. The Scaler controls the display processing in an LCD TV, e.g. like the deflection circuit in a CRT-based TV. It controls all the view modes (e.g. like "zooming" and "shifting"). Features like PC (VGA) or HD inputs, are also handled by this part.

9.7.1 Features

The Scaler provides several key IC functions:

- Scaling.
- Auto-configuration/ Auto-Detection.
- Various Input Ports:
  - Analog RGB.
  - Video Graphics.
- Integrated LVDS Transmitter.
- On-chip Micro-controller

9.7.2 Inputs

Analog RGB

The RGB input is fed to pins 142, 143, 147, 148, 151 and 152. This input consists of either the Hercules RGB output or the RGB/YpbPr input of the VGA connector. The Scaler can switch between the two signals via the PC_HD_SEL signal and selection IC SM5301 (7461).

PC (VGA) input

The VGA input is processed by the VGA block of the Scaler. The Scaler supports up to 1080i and UXGA 60Hz formats.

DVI-D input

The DVI-D input is not supported by this chassis.

9.7.3 Output

The Display Output Port provides data and control signals that permit the Scaler to connect to a variety of display devices using a TTL or LVDS interface. The output interface has four channel 6/8-bit LVDS transmitters and is configurable for single or dual wide LVDS. All display data and timing signals are synchronous with the DCLK output clock. The integrated LVDS transmitter is programmable to allow the data and control signals to be mapped into any sequence depending on the specified receiver format.

9.8 Audio Processing

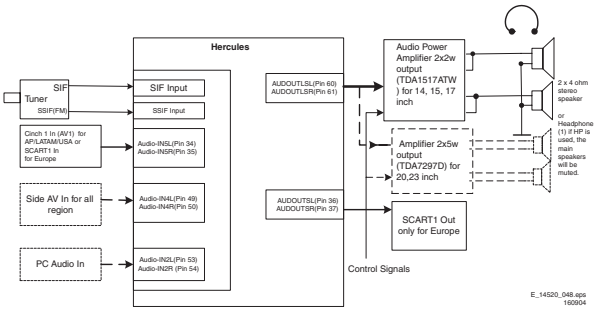


Figure 9-3 Block diagram audio processing

The audio decoding is done entirely via the Hercules. The IF output from the Tuner is fed directly to either the Video-IF or the Sound-IF input depending on the type of concept chosen. There are mainly two types of decoder in the Hercules, an analogue decoder that decodes only Mono, regardless of any standards, and a digital decoder (or DEMDEC) that can decode both Mono as well as Stereo, again regardless of any standards.

In this chassis, the analogue decoder is used in two cases:
- It is used for AM Sound demodulation in the Europe SECAM LL' transmission.
- It is used for all FM demodulation in AV-Stereo sets.

9.8.1 Diversity

The diversity for the Audio decoding can be broken up into two main concepts:
- The Quasi Split Sound concept used in Europe and some AP sets.
- The Inter Carrier concept, used in NAFTA and LATAM.

The UOC-III family makes no difference anymore between QSS- and Intercarrier IF, nearly all types are software-switchable between the two SAW-filter constructions.

Simple data settings are required for the set to determine whether it is using the Inter Carrier or the QSS concept. These settings are done via the "QSS" and "FMI" bit found in SAM mode. Due to the diversity involved, the data for the 2 bits are being placed in the NVM location and it is required to write once during startup.

On top of that, it can be further broken down into various systems depending on the region. The systems or region chosen, will in turn affect the type of sound standard that is/are allowed to be decoded.
- For the case of Europe, the standard consists of BG/DK/I/LL' for a Multi-System set. There are also versions of Eastern Europe and Western Europe set and the standard for decoding will be BG/DK and I/DK respectively. FM Radio is a feature diversity for the Europe sets. The same version can have either FM Radio or not, independent of the system (e.g. sets with BG/DK/I/LL' can have or not have FM radio).
- For the case of NAFTA and LATAM, there is only one transmission standard, which is the M standard. The diversity then will be based on whether it has a dBx noise reduction or a Non-dBx (no dBx noise reduction).
- For the case of AP, the standard consists of BG/DK/I/M for a Multi-System set. The diversity here will then depends on the region. AP China can have a Multi-System and I/DK version. For India, it might only be BG standard.

9.8.2 Functionality

The features available in the Hercules are as follows:
- Treble and Bass Control.
- Surround Sound Effect that includes:
  - Incredible Stereo.
  - Incredible Mono.
  - 3D Sound (not for AV Stereo).
  - TruSurround (not for AV Stereo).
  - Virtual Dolby Surround, VDS422 (not for AV Stereo).
  - Virtual Dolby Surround, VDS423 (not for AV Stereo).
  - Dolby Pro-Logic (not for AV Stereo).
- Bass Feature that includes:
  - Dynamic Ultra-Bass.
  - Dynamic Bass Enhancement.
  - BBE (not for AV Stereo).
- Auto-Volume Leveler.
- 5 Band Equalizer.
- Loudness Control.

All the features stated are available for the Full Stereo versions and limited features for the AV Stereo

9.8.3 Audio Amplifier

The audio amplifier part is very straightforward. There are two different executions:
- **14, 15, 17 inch:** Amplification is done via the integrated power amplifier TDA1517, and delivers a maximum output of 2 x 6 W_rms. Normal operating supply is from 6 V to 18 V.
- **20, 23 inch:** Amplification is done via the integrated power amplifier TDA7297, and delivers a maximum output of 2 x 15 W_rms. Normal operating supply is from 6.5 V to 18 V.

Muting is done via the SOUND_ENABLE line connected to pin 13 of the amplifier-IC and coming from the Hercules.

9.8.4 Audio: Lip Sync

The LC4.1E is not equipped with Lip Sync. This is not needed.

9.9 Control

9.9.1 Hercules

The System Board has two main micro-controllers on board. These are:
- On-chip x86 micro-controller (OCM) from Genesis LCD TV/ Monitor Controller.
- On-chip 80C51 micro-controller from Philips Semiconductor UOCIII (Hercules) series.

Each micro-controller has it own I2C bus which host its own internal devices.
The Hercules is integrated with the Video and Audio Processor. For dynamic data storage, such as SMART PICTURE and SMART SOUND settings, an external NVM IC is being used. Another feature includes an optional Teletext/Closed Caption decoder with the possibility of different page storage depending on the Hercules type number.

The Micro Controller ranges in ROM from 128 kB with no TXT-decoder to 128 kB with a 10 page Teletext or with Closed Caption.

9.9.2 Block Diagram

The block diagram of the Micro Controller application is shown below.

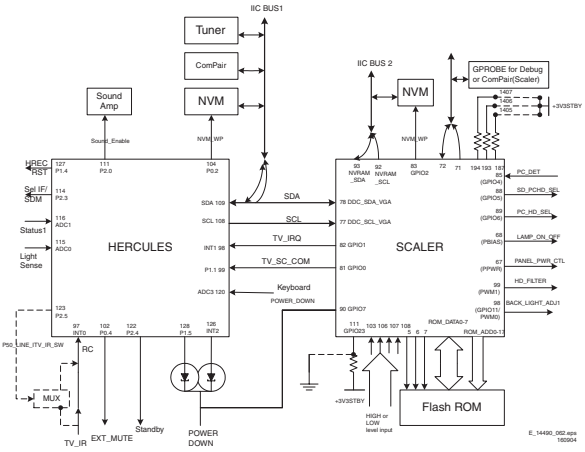


Figure 9-4 Micro Controller block diagram

9.9.3 Basic Specification

The Micro Controller operates at the following supply voltages:
- +3.3 V_dc at pins 4, 88, 94, and 109.
- +1.8 V_dc at pins 93, 96, and 117.
- I2C pull up supply: +3.3V_dc.

9.9.4 Pin Configuration and Functionality

The ports of the Micro Controller can be configured as follows:
- A normal input port.
- An input ADC port.
- An output Open Drain port.
- An output Push-Pull port.
- An output PWM port.
- Input/Output Port

9.10 LCD Display

9.10.1 Specifications

Panel model	:	T140VN01 (14”)
	:	LC150X02 (15”)
	:	LC171W03 (17”)
	:	LC201V02 (20”)
	:	QD23WL04 (23”)
Resolution (HxV)	:	640x480 pixels (14”)
	:	1024x768 pixels (15”)
	:	1280x768 pixels (17”)
	:	640x480 pixels (20”)
	:	1280x768 (23”)
Luminance	:	450 nit (14”)
	:	450 nit (15”)
	:	450 nit (17”)
	:	450 nit (20”)
	:	450 nit (23”)
Supplier	:	AU Optronics Corp (14”)
	:	LG.Philips LCD (15”, 17”, 20”)
	:	Quanta Displays Inc (23”)

9.11 Abbreviation list

0/6/12	SCART switch control signal on A/V board. 0 = loop through (AUX to TV), 6 = play 16:9 format, 12 = play 4:3 format
1080i	1080 visible lines, interlaced
1080p	1080 visible lines, progressive scan
2CS	2 Carrier Stereo
480i	480 visible lines, interlaced
480p	480 visible lines, progressive scan
ACI	Automatic Channel Installation: algorithm that installs TV channels directly from a cable network by means of a predefined TXT page
ADC	Analogue to Digital Converter
AFC	Automatic Frequency Control: control signal used to tune to the correct frequency
AGC	Automatic Gain Control: algorithm that controls the video input of the feature box
AM	Amplitude Modulation
AP	Asia Pacific
AR	Aspect Ratio: 4 by 3 or 16 by 9
ASD	Automatic Standard Detection
AV	Audio Video
B-SC1-IN	Blue SCART1 in
B-SC2-IN	Blue SCART2 in
B-TXT	Blue teletext
B/G	Monochrome TV system. Sound carrier distance is 5.5 MHz
BOCMA	Bimos one Chip Mid-end Architecture: video and chroma decoder
C-FRONT	Chrominance front input
CBA	Circuit Board Assembly (or PWB)
CL	Constant Level: audio output to connect with an external amplifier
CLUT	Colour Look Up Table
ComPair	Computer aided rePair
CSM	Customer Service Mode
CVBS	Composite Video Blanking and Synchronisation
CVBS-EXT	CVBS signal from external source (VCR, VCD, etc.)
CVBS-INT	CVBS signal from Tuner
CVBS-MON	CVBS monitor signal
CVBS-TER-OUT	CVBS terrestrial out
DAC	Digital to Analogue Converter
DBE	Dynamic Bass Enhancement: extra low frequency amplification
DFU	Directions For Use: owner's manual
DNR	Dynamic Noise Reduction
DRAM	Dynamic RAM
DSP	Digital Signal Processing
DST	Dealer Service Tool: special (European) remote control designed for service technicians
DTS	Digital Theatre Sound
DVD	Digital Video Disc
EEPROM	Electrically Erasable and Programmable Read Only Memory
EPG	Electronic Program Guide: system used by broadcasters to transmit TV guide information (= NexTView)
EPLD	Electronic Programmable Logic Device
EU	EUrope
EXT	EXTernal (source), entering the set by SCART or by cinches (jacks)
FBL	Fast Blanking: DC signal accompanying RGB signals
FBL-SC1-IN	Fast blanking signal for SCART1 in
FBL-SC2-IN	Fast blanking signal for SCART2 in

FBL-TXT	Fast Blanking Teletext
FLASH	FLASH memory
FM	Field Memory / Frequency Modulation
FMR	FM Radio
FRC	Frame Rate Converter
FRONT-C	Front input chrominance (SVHS)
FRONT-DETECT	Front input detection
FRONT-Y_CVBS	Front input luminance or CVBS (SVHS)
G-SC1-IN	Green SCART1 in
G-SC2-IN	Green SCART2 in
G-TXT	Green teletext
H	H_sync to the module
HA	Horizontal Acquisition: horizontal sync pulse coming out of the BOCMA
HD	High Definition
HP	HeadPhone
I	Monochrome TV system. Sound carrier distance is 6.0 MHz
I2C	Integrated IC bus
I2S	Integrated IC Sound bus
IC	Integrated Circuit
IF	Intermediate Frequency
Interlaced	Scan mode where two fields are used to form one frame. Each field contains half the number of the total amount of lines. The fields are written in "pairs", causing line flicker.
IR	Infra Red
IRQ	Interrupt ReQuest
Last Status	The settings last chosen by the customer and read and stored in RAM or in the NVM. They are called at start-up of the set to configure it according the customers wishes
LATAM	LATin AMerica
LC04	Philips chassis name for LCD TV 2004 project
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LINE-DRIVE	Line drive signal
L/L'	Monochrome TV system. Sound carrier distance is 6.5 MHz. L' is Band I, L is all bands except for Band I
LS	LoudSpeaker
LVDS	Low Voltage Differential Signalling, data transmission system for high speed and low EMI communication.
M/N	Monochrome TV system. Sound carrier distance is 4.5 MHz
MOSFET	Metal Oxide Semiconductor Field Effect Transistor
MPEG	Motion Pictures Experts Group
MSP	Multi-standard Sound Processor: ITT sound decoder
MUTE	MUTE Line
NC	Not Connected
NICAM	Near Instantaneous Compounded Audio Multiplexing. This is a digital sound system, used mainly in Europe.
NTSC	National Television Standard Committee. Colour system used mainly in North America and Japan. Colour carrier NTSC M/N = 3.579545 MHz, NTSC 4.43 = 4.433619 MHz (this is a VCR norm, it is not transmitted off-air)
NVM	Non Volatile Memory: IC containing TV related data (for example, options)
O/C	Open Circuit
ON/OFF LED	On/Off control signal for the LED
OSD	On Screen Display
P50	Project 50 communication: protocol between TV and peripherals
PAL	Phase Alternating Line. Colour system used mainly in Western Europe (colour carrier = 4.433619 MHz) and South America (colour carrier PAL M = 3.575612 MHz and PAL N = 3.582056 MHz)
PC	Personal Computer
PCB	Printed Circuit Board (or PWB)
PIG	Picture In Graphic
PIP	Picture In Picture
PLL	Phase Locked Loop. Used, for example, in FST tuning systems. The customer can directly provide the desired frequency
Progressive Scan	Scan mode where all scan lines are displayed in one frame at the same time, creating a double vertical resolution.
PWB	Printed Wiring Board (or PCB)
RAM	Random Access Memory
RC	Remote Control transmitter
RC5	Remote Control system 5, the signal from the remote control receiver
RGB	Red, Green, and Blue. The primary colour signals for TV. By mixing levels of R, G, and B, all colours (Y/C) are reproduced.
RGBHV	Red, Green, Blue, Horizontal sync, and Vertical sync
ROM	Read Only Memory
SAM	Service Alignment Mode
SIF	Sound Intermediate Frequency
SC	SandCastle: two-level pulse derived from sync signals
SC1-OUT	SCART output of the MSP audio IC
SC2-B-IN	SCART2 Blue in
SC2-C-IN	SCART2 chrominance in
SC2-OUT	SCART output of the MSP audio IC
S/C	Short Circuit
SCART	Syndicat des Constructeurs d'Appareils Radiorecepteurs et Televisieurs
SCL	CLock Signal on I2C bus
SD	Standard Definition
SDA	DAta Signal on I2C bus
SDRAM	Synchronous DRAM
SECAM	SEequence Couleur Avec Memoire. Colour system used mainly in France and Eastern Europe. Colour carriers = 4.406250 MHz and 4.250000 MHz
SIF	Sound Intermediate Frequency
SMPS	Switch Mode Power Supply
SND	SouND
SNDL-SC1-IN	Sound left SCART1 in
SNDL-SC1-OUT	Sound left SCART1 out
SNDL-SC2-IN	Sound left SCART2 in
SNDL-SC2-OUT	Sound left SCART2 out
SNDR-SC1-IN	Sound right SCART1 in
SNDR-SC1-OUT	Sound right SCART1 out
SNDR-SC2-IN	Sound right SCART2 out
SNDR-SC2-OUT	Sound right SCART2 out
SNDS-VL-OUT	Surround sound left variable level out
SNDS-VR-OUT	Surround sound right variable level out
SOPS	Self Oscillating Power Supply
S/PDIF	Sony Philips Digital InterFace
SRAM	Static RAM
STBY	STandBY
SVHS	Super Video Home System
SW	SubWoofer / SoftWare
THD	Total Harmonic Distortion
TXT	TeleteXT
uP	Microprocessor
VA	Vertical Acquisition
VL	Variable Level out: processed audio output toward external amplifier

VCR	Video Cassette Recorder
VGA	Video Graphics Array
WD	Watch Dog
WYSIWYR	What You See Is What You Record: record selection that follows main picture and sound
XTAL	Quartz crystal
YPbPr	Component video (Y= Luminance, Pb/Pr= Colour difference signals)
Y/C	Luminance (Y) and Chrominance (C) signal
Y-OUT	Luminance-signal
YUV	Component video

9.12 IC Data Sheets

This section shows the internal block diagrams and pin layouts of ICs that are drawn as "black boxes" in the electrical diagrams (with the exception of "memory" and "logic" ICs).

9.12.1 Diagram A7, Type GM5221 (IC7401)

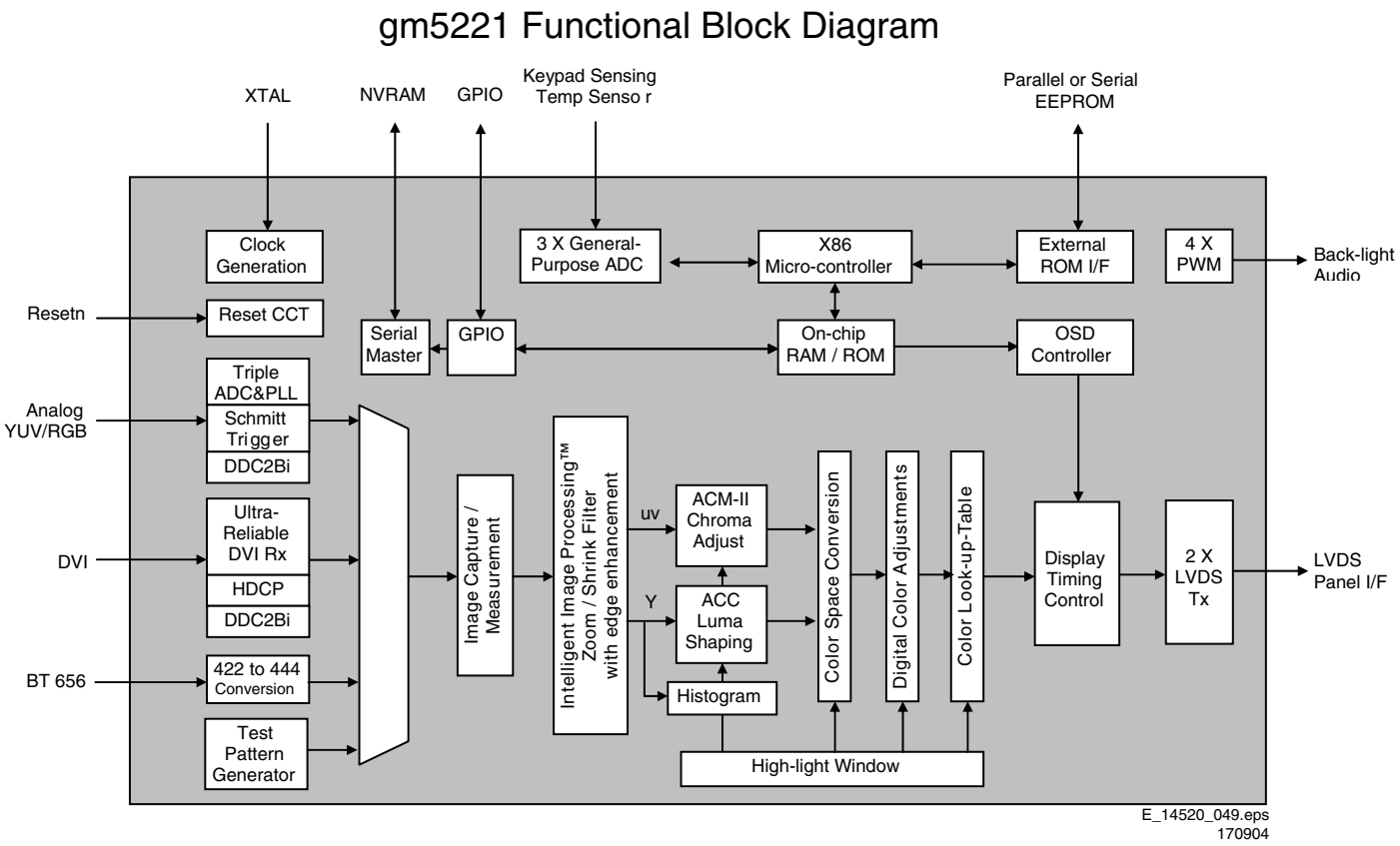
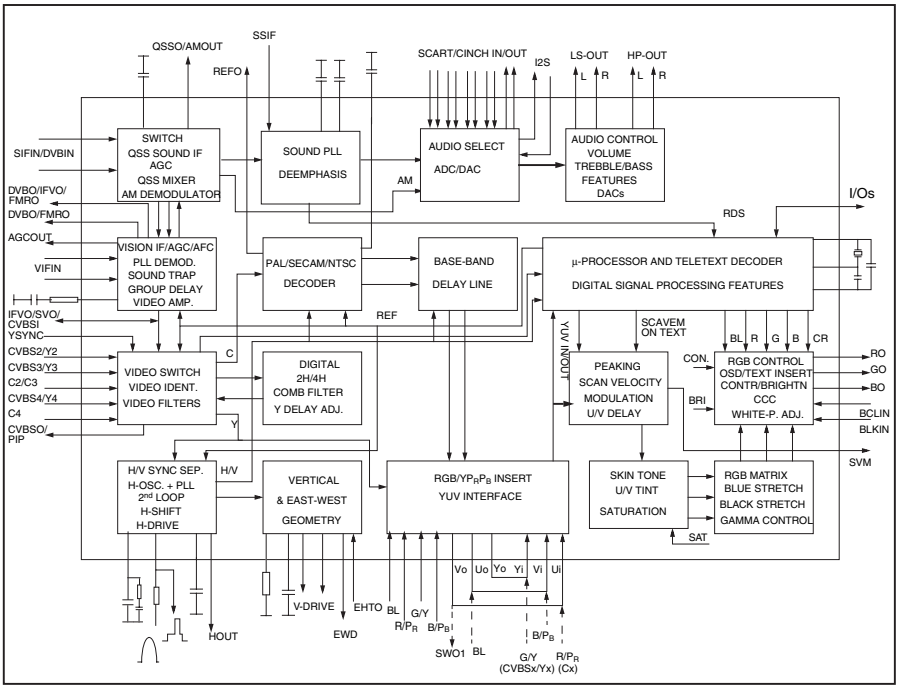


Figure 9-5 Internal Block Diagram

9.12.2 Diagram A2, Type TDA12029H (IC7011)

Block diagram of the “AV-stereo” TV processor with audio DSP



Pin configuration “stereo” and “AV-stereo” versions with Audio DSP

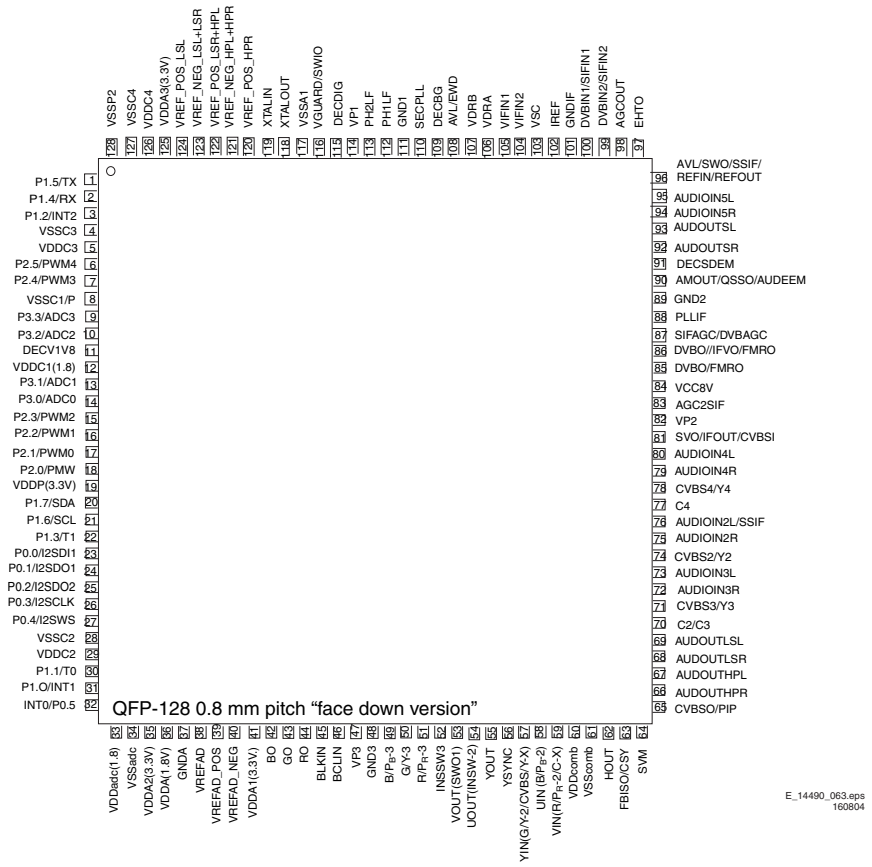
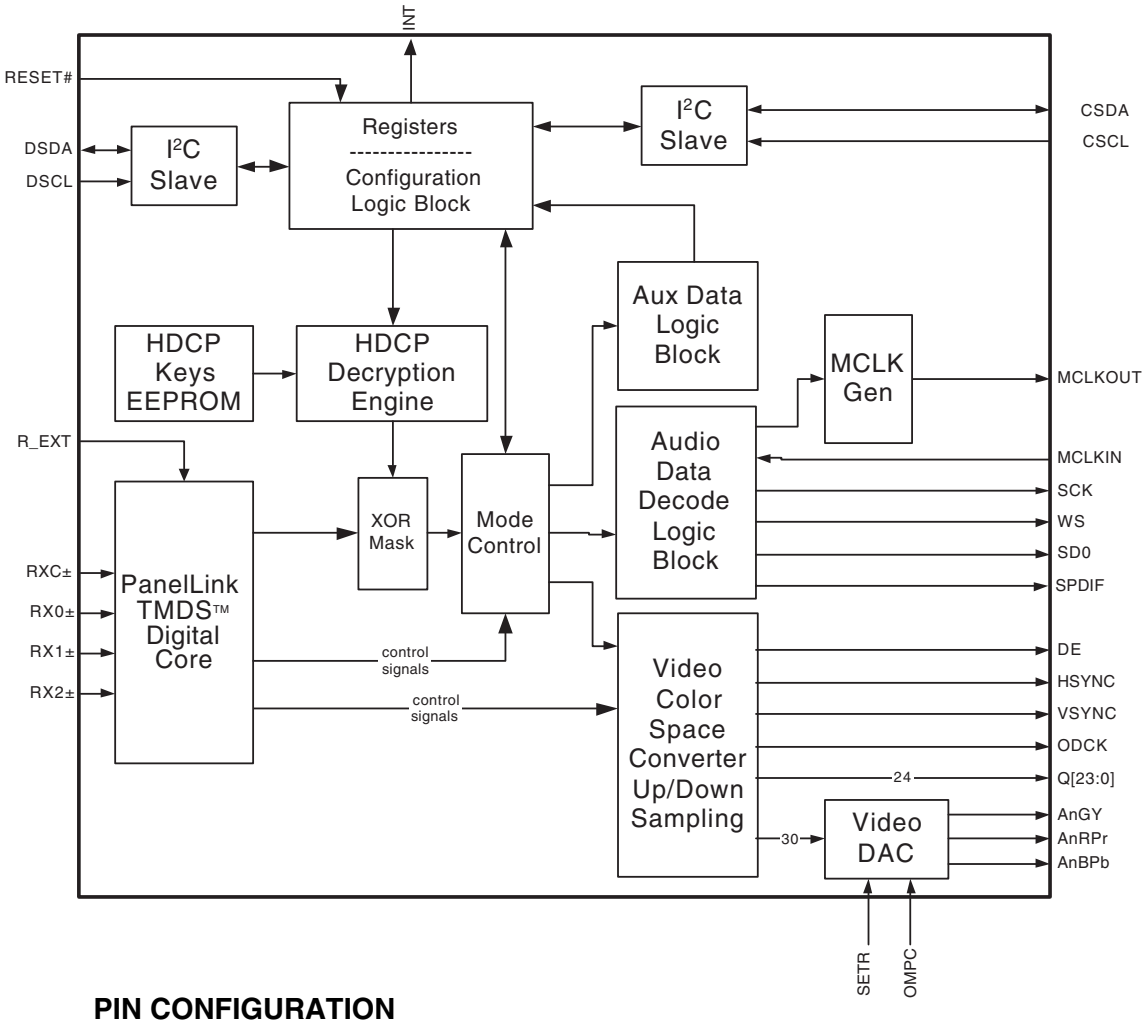


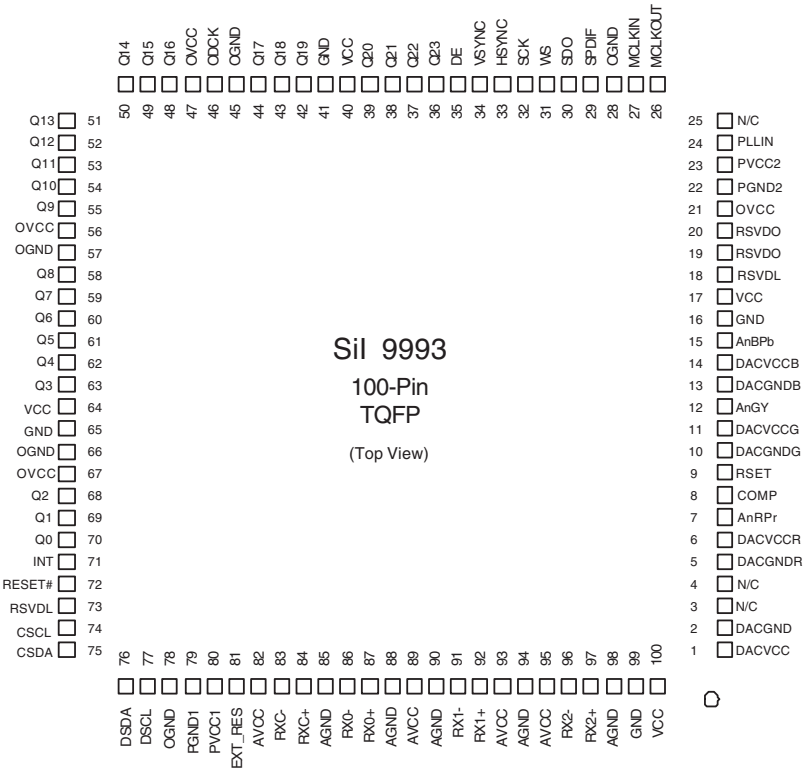
Figure 9-6 Internal Block Diagram and Pin Configuration

9.12.3 Diagram A12, Type S9993CT (IC7808)

BLOCK DIAGRAM



PIN CONFIGURATION



E_14620_149.eps
090804

Figure 9-7 Internal Block Diagram and Pin Configuration

10. Spare Parts List

Set Level

Various

8402	3139 131 03981	Cable 41p 150
8404⚠	3139 131 03991	Cable 20p 150
8870⚠	3139 110 27891	Cable 6p 400
8870	3139 131 04201	Cable 6p 480
8870	3139 131 04211	Cable 6p 560
0096	2422 076 00546	Cable FM aerial
1910	3128 147 15821	RC1553801/01
8105	3104 311 09351	Cable 4P
8105⚠	3139 131 04231	Cable 4p 280
8105	3139 131 04831	Cable 4p 220
8191	2422 076 00474	Cable 2p/1500/2p
8193	2422 076 00585	Cable 1.5M

TV & Scaler board [A]

Various

1001	2422 543 01414	Xtal 24M576
1007	2422 025 08149	Connector 6p m
1008	2422 025 09405	Connector 2p m
1010	2422 025 16963	Connector 10p m
1101	4822 265 10703	Socket scart 21p
1302⚠	3139 147 19701	UR1316/A I H-3
1328	2422 549 44372	SAW 38.9MHz K3953L
1330	2422 549 44369	SAW 38.9MHz K9656L
1331	4822 267 10748	Connector 3p
1401	2422 025 09406	Connector 4p m
1402	2422 025 18024	Connector 40p m
1403	2422 543 01374	Xtal 14.318 Mhz
1404	2422 025 18314	Connector 20p m v 1.25
1461	2422 025 18477	Socket sub-D 15p f h
1701	2422 025 10768	Connector 3p m
1706	2422 025 16966	Connector 5p m
1910	2422 025 16705	Connector 12p m
1951	2422 025 16702	Connector 5p m h
8706	3104 157 02361	Cable 5p 280
8910	3139 131 04311	Cable 12p 180
8910	3139 131 04321	Cable 12p 140
8951	3139 110 35861	Cable 5p 220

⊣⊢

2001	4822 126 13879	220nF +80-20% 16V
2003	4822 124 80151	47µF 16V
2004	4822 126 13879	220nF +80-20% 16V
2005	2238 586 59812	100nF 20% 50V 0603
2006	4822 126 14487	8.2pF 0.5% 50V 0603
2007	4822 126 14487	8.2pF 0.5% 50V 0603
2008	3198 017 44740	470nF 10V 0603
2009	3198 017 41050	1µF 10V 0603
2010	5322 126 11582	6.8nF 10% 63V
2011	4822 126 13879	220nF +80-20% 16V
2012	4822 124 12095	100µF 20% 16V
2013	2238 586 59812	100nF 20% 50V 0603
2014	2020 552 94427	100pF 5% 50V
2015	2020 552 00002	3.3nF 2% 50V 0805
2016	2238 586 59812	100nF 20% 50V 0603
2017	2238 586 59812	100nF 20% 50V 0603
2018	5322 126 11583	10nF 10% 50V 0603
2019	2222 867 15339	33pF 5% 50V 0603
2020	2222 867 15339	33pF 5% 50V 0603
2021	2222 867 15339	33pF 5% 50V 0603
2022	2222 867 15339	33pF 5% 50V 0603
2023	4822 126 13879	220nF +80-20% 16V
2024	4822 124 12095	100µF 20% 16V
2025	2222 867 15339	33pF 5% 50V 0603
2026	2222 867 15339	33pF 5% 50V 0603
2027	2238 586 59812	100nF 20% 50V 0603
2028	5322 126 11583	10nF 10% 50V 0603
2029	2020 552 00002	3.3nF 2% 50V 0805
2030	2238 586 59812	100nF 20% 50V 0603
2031	2238 586 59812	100nF 20% 50V 0603
2032	2238 586 59812	100nF 20% 50V 0603
2033	4822 126 13879	220nF +80-20% 16V
2034	5322 126 11583	10nF 10% 50V 0603
2035	4822 124 12095	100µF 20% 16V
2036	4822 126 11785	47pF 5% 50V 0603
2037	4822 126 11785	47pF 5% 50V 0603
2040	4822 126 13883	220pF 5% 50V
2041	4822 126 13879	220nF +80-20% 16V
2042	2020 552 00002	3.3nF 2% 50V 0805
2043	2238 586 59812	100nF 20% 50V 0603
2044	4822 126 13879	220nF +80-20% 16V
2045	5322 126 11583	10nF 10% 50V 0603
2046	4822 126 11669	27pF 5% 50V 0603
2047	4822 126 11669	27pF 5% 50V 0603
2048	4822 126 11669	27pF 5% 50V 0603
2049	4822 124 23002	10µF 16V
2050	4822 122 33761	22pF 5% 50V
2051	4822 124 23002	10µF 16V
2052	3198 016 31020	1nF 25V 0603
2053	2238 586 59812	100nF 20% 50V 0603
2054	2238 586 59812	100nF 20% 50V 0603
2055	2238 586 59812	100nF 20% 50V 0603
2056	2238 586 59812	100nF 20% 50V 0603
2057	2238 586 59812	100nF 20% 50V 0603
2058	3198 016 31020	1nF 25V 0603
2060	2238 586 59812	100nF 20% 50V 0603
2061	4822 124 23002	10µF 16V
2063	3198 017 31540	150nF 10V 0603
2067	3198 016 31020	1nF 25V 0603
2068	4822 126 13879	220nF +80-20% 16V
2071	4822 124 12095	100µF 20% 16V
2072	4822 126 13879	220nF +80-20% 16V
2073	5322 126 11583	10nF 10% 50V 0603
2074	4822 126 13879	220nF +80-20% 16V
2076	4822 126 13879	220nF +80-20% 16V
2077	3198 017 41050	1µF 10V 0603
2078	2020 552 94427	100pF 5% 50V
2079	2238 916 15641	22nF 10% 25V 0603
2082	3198 017 41050	1µF 10V 0603
2083	2020 552 96637	10µF 10% 6.3V 0805
2099	3198 016 31020	1nF 25V 0603
2101	4822 126 14241	330pF 0603 50V
2102	4822 126 14491	2.2µF 10V 0805
2103	4822 126 14241	330pF 0603 50V
2104	4822 126 14491	2.2µF 10V 0805
2105	4822 126 14241	330pF 0603 50V
2106	4822 126 14491	2.2µF 10V 0805
2107	4822 126 14241	330pF 0603 50V
2108	4822 126 14491	2.2µF 10V 0805
2302	4822 122 33761	22pF 5% 50V
2303	4822 122 33761	22pF 5% 50V
2307	3198 017 34730	47nF 16V 0603
2308	3198 030 82280	2.2µF 20% 50V
2309	2020 012 93761	330µF 6.3V
2311	3198 030 72290	22µF 20% 35V
2313	3198 016 31020	1nF 25V 0603
2314	2238 586 59812	100nF 20% 50V 0603
2317	3198 016 31020	1nF 25V 0603
2318	3198 016 31020	1nF 25V 0603
2321	5322 126 11583	10nF 10% 50V 0603
2324	5322 126 11583	10nF 10% 50V 0603
2355	3198 030 82280	2.2µF 20% 50V
2356	3198 030 82280	2.2µF 20% 50V
2357	2238 586 59812	100nF 20% 50V 0603
2358	5322 126 11579	3.3nF 10% 63V
2359	5322 126 11583	10nF 10% 50V 0603
2370	3198 017 41050	1µF 10V 0603
2371	3198 017 41050	1µF 10V 0603
2372	3198 016 31020	1nF 25V 0603
2373	3198 016 31020	1nF 25V 0603
2374	2238 586 59812	100nF 20% 50V 0603
2375	4822 124 12082	10µF 20% 50V
2376	2238 586 59812	100nF 20% 50V 0603
2377	2238 586 59812	100nF 20% 50V 0603
2378	4822 126 13879	220nF +80-20% 16V
2379	4822 126 13879	220nF +80-20% 16V
2380	4822 124 12095	100µF 20% 16V
2381	2238 586 59812	100nF 20% 50V 0603
2382	2238 586 59812	100nF 20% 50V 0603
2383	2238 586 59812	100nF 20% 50V 0603
2384	2238 586 59812	100nF 20% 50V 0603
2385	2238 586 59812	100nF 20% 50V 0603
2387	2238 586 59812	100nF 20% 50V 0603
2388	2020 012 93761	330µF 6.3V
2389	4822 126 11785	47pF 5% 50V 0603
2390	4822 126 11785	47pF 5% 50V 0603
2391	4822 126 11785	47pF 5% 50V 0603
2394	2238 586 59812	100nF 20% 50V 0603
2395	2238 586 59812	100nF 20% 50V 0603
2396	4822 124 23002	10µF 16V
2397	3198 017 41050	1µF 10V 0603
2398	3198 017 41050	1µF 10V 0603
2399	4822 126 11785	47pF 5% 50V 0603
2401	4822 124 11131	47µF 6.3V
2402	2238 586 59812	100nF 20% 50V 0603
2403	2238 586 59812	100nF 20% 50V 0603
2404	2238 586 59812	100nF 20% 50V 0603
2405	2238 586 59812	100nF 20% 50V 0603
2406	2238 586 59812	100nF 20% 50V 0603
2407	2238 586 59812	100nF 20% 50V 0603
2408	2238 586 59812	100nF 20% 50V 0603
2409	2238 586 59812	100nF 20% 50V 0603
2410	2238 586 59812	100nF 20% 50V 0603
2411	2238 586 59812	100nF 20% 50V 0603
2412	2238 586 59812	100nF 20% 50V 0603
2413	2238 586 59812	100nF 20% 50V 0603
2414	2238 586 59812	100nF 20% 50V 0603
2415	2238 586 59812	100nF 20% 50V 0603
2416	2238 586 59812	100nF 20% 50V 0603
2417	2238 586 59812	100nF 20% 50V 0603
2418	4822 126 13883	220pF 5% 50V
2419	4822 126 13883	220pF 5% 50V
2420	4822 124 11131	47µF 6.3V
2421	2238 586 59812	100nF 20% 50V 0603
2422	2238 586 59812	100nF 20% 50V 0603
2423	2238 586 59812	100nF 20% 50V 0603
2424	2238 586 59812	100nF 20% 50V 0603
2425	2238 586 59812	100nF 20% 50V 0603
2426	4822 126 13883	220pF 5% 50V
2427	4822 126 13883	220pF 5% 50V
2428	4822 124 11131	47µF 6.3V
2429	2238 586 59812	100nF 20% 50V 0603
2430	2238 586 59812	100nF 20% 50V 0603
2431	2238 586 59812	100nF 20% 50V 0603
2432	2238 586 59812	100nF 20% 50V 0603
2433	2238 586 59812	100nF 20% 50V 0603
2434	2238 586 59812	100nF 20% 50V 0603
2435	4822 126 13883	220pF 5% 50V
2436	4822 126 13883	220pF 5% 50V
2437	4822 124 11131	47µF 6.3V
2438	2238 586 59812	100nF 20% 50V 0603
2439	2238 586 59812	100nF 20% 50V 0603
2440	2238 586 59812	100nF 20% 50V 0603
2441	2238 586 59812	100nF 20% 50V 0603
2442	2238 586 59812	100nF 20% 50V 0603
2443	3198 016 35680	5.6pF 0.5pF 50V 0603
2444	3198 016 35680	5.6pF 0.5pF 50V 0603
2445	2238 586 59812	100nF 20% 50V 0603
2448	2238 586 59812	100nF 20% 50V 0603
2451	2222 867 15339	33pF 5% 50V 0603
2460	2238 586 59812	100nF 20% 50V 0603
2461	4822 122 33761	22pF 5% 50V
2462	4822 122 33761	22pF 5% 50V
2463	2238 586 59812	100nF 20% 50V 0603
2464	5322 126 11583	10nF 10% 50V 0603
2465	5322 126 11583	10nF 10% 50V 0603
2466	5322 126 11583	10nF 10% 50V 0603
2467	5322 126 11583	10nF 10% 50V 0603
2468	5322 126 11583	10nF 10% 50V 0603
2469	5322 126 11583	10nF 10% 50V 0603
2470	5322 126 11583	10nF 10% 50V 0603
2471	4822 124 11131	47µF 6.3V
2472	2238 586 59812	100nF 20% 50V 0603
2473	2238 586 59812	100nF 20% 50V 0603
2474	2238 586 59812	100nF 20% 50V 0603
2475	2238 586 59812	100nF 20% 50V 0603
2477	3198 017 41050	1µF 10V 0603
2478	3198 017 41050	1µF 10V 0603
2479	3198 017 41050	1µF 10V 0603
2480	3198 017 41050	1µF 10V 0603
2481	3198 017 41050	1µF 10V 0603
2482	3198 017 41050	1µF 10V 0603
2483	2238 586 59812	100nF 20% 50V 0603
2510	2238 586 59812	100nF 20% 50V 0603
2513	4822 124 23002	10µF 16V
2514	4822 122 33752	15pF 5% 50V
2515	5322 126 11583	10nF 10% 50V 0603
2516	3198 016 36810	680pF 25V 0603
2517	5322 126 11583	10nF 10% 50V 0603
2518	5322 126 11583	10nF 10% 50V 0603
2519	3198 016 31020	1nF 25V 0603
2520	2238 586 59812	100nF 20% 50V 0603
2703	4822 124 23002	10µF 16V
2712	3198 017 41050	1µF 10V 0603
2714	2020 012 93795	470µF 20% 16V
2718	3198 017 41050	1µF 10V 0603
2719	2238 586 59812	100nF 20% 50V 0603
2724	4822 124 12095	100µF 20% 16V
2736	4822 124 80791	470µF 20% 16V
2737	4822 124 80791	470µF 20% 16V
2738	3198 016 31020	1nF 25V 0603
2739	3198 016 31020	1nF 25V 0603
2741	4822 126 13881	470pF 5% 50V
2742	4822 126 13881	470pF 5% 50V
2910	4822 126 13881	470pF 5% 50V
2911	3198 030 72290	22µF 20% 35V
2920	4822 124 80151	47µF 16V
2921	4822 124 80151	47µF 16V

2930	4822 124 80791	470µF 20% 16V
2931	4822 126 13881	470pF 5% 50V
2933	4822 124 80791	470µF 20% 16V
2934	4822 126 13193	4.7nF 10% 63V
2935	4822 124 80195	470µF 20% 10V
2936	5322 126 11578	1nF 10% 50V 0603
2937	5322 126 11578	1nF 10% 50V 0603
2938	5322 126 11578	1nF 10% 50V 0603
2939	5322 126 11578	1nF 10% 50V 0603
2940	5322 126 11578	1nF 10% 50V 0603
2941	5322 126 11578	1nF 10% 50V 0603
2942	5322 126 11578	1nF 10% 50V 0603
2959	2238 586 59812	100nF 20% 50V 0603
2960	4822 124 80151	47µF 16V
2961	5322 126 11583	10nF 10% 50V 0603
2962	2238 586 59812	100nF 20% 50V 0603
2994	4822 124 11131	47µF 6.3V
2995	2238 586 59812	100nF 20% 50V 0603
2996	2238 586 59812	100nF 20% 50V 0603
2997	4822 124 11131	47µF 6.3V
2998	4822 124 42027	470µF 20% 6,3V

–WW–

3001	3198 021 31080	1Ω 5% 0603
3002	4822 051 30223	22kΩ 5% 0.062W
3003	3198 021 31080	1Ω 5% 0603
3004	4822 051 30223	22kΩ 5% 0.062W
3005	4822 051 30223	22kΩ 5% 0.062W
3006	4822 051 30471	47Ω 5% 0.062W
3007	4822 051 30472	4.7Ω 5% 0.062W
3008	4822 117 12925	47kΩ 1% 0.063W 0603
3009	4822 117 13632	100kΩ 1% 0603 0.62W
3010	4822 051 30102	1kΩ 5% 0.062W
3012	4822 051 30331	330Ω 5% 0.062W
3013	4822 051 30101	100Ω 5% 0.062W
3016	4822 051 30101	100Ω 5% 0.062W
3019	4822 051 30331	330Ω 5% 0.062W
3020	4822 051 30331	330Ω 5% 0.062W
3022	4822 051 30102	1kΩ 5% 0.062W
3023	4822 051 30103	10kΩ 5% 0.062W
3024	4822 051 30472	4.7Ω 5% 0.062W
3025	2322 704 62702	2.7kΩ 1%
3026	5322 117 13057	820Ω 1% 0.063W 0603
3027	4822 051 30103	10kΩ 5% 0.062W
3028	4822 051 30472	4.7Ω 5% 0.062W
3029	4822 051 30102	1kΩ 5% 0.062W
3030	4822 051 30472	4.7Ω 5% 0.062W
3031	4822 051 30471	47Ω 5% 0.062W
3032	3198 021 31820	1.8kΩ 5% 0.062W 0603
3033	4822 117 13632	100kΩ 1% 0603 0.62W
3034	4822 117 12891	220kΩ 1%
3035	4822 051 30101	100Ω 5% 0.062W
3036	2322 704 65603	65kΩ 0603
3037	4822 051 30683	68kΩ 5% 0.062W
3048	4822 051 30103	10kΩ 5% 0.062W
3049	4822 051 30331	330Ω 5% 0.062W
3050	4822 051 30331	330Ω 5% 0.062W
3051	4822 051 30331	330Ω 5% 0.062W
3052	4822 051 30101	100Ω 5% 0.062W
3054	4822 051 30103	10kΩ 5% 0.062W
3055	4822 051 30102	1kΩ 5% 0.062W
3056	4822 051 30472	4.7Ω 5% 0.062W
3057	4822 051 30681	680Ω 5% 0.062W
3058	4822 051 30101	100Ω 5% 0.062W
3059	4822 051 30102	1kΩ 5% 0.062W
3060	4822 051 30393	39kΩ 5% 0.062W
3061	4822 117 13632	100kΩ 1% 0603 0.62W
3063	4822 051 30222	2.2kΩ 5% 0.062W
3066	4822 051 30472	4.7Ω 5% 0.062W
3070	4822 051 30101	100Ω 5% 0.062W
3072	4822 051 30102	1kΩ 5% 0.062W
3073	4822 051 30153	15kΩ 5% 0.062W
3074	4822 117 13632	100kΩ 1% 0603 0.62W
3075	4822 051 30472	4.7Ω 5% 0.062W
3077	4822 051 30472	4.7Ω 5% 0.062W
3078	4822 051 30472	4.7Ω 5% 0.062W
3079	4822 051 30222	2.2kΩ 5% 0.062W
3080	2322 704 61002	1kΩ 1%
3081	4822 051 30101	100Ω 5% 0.062W
3082	4822 051 30472	4.7Ω 5% 0.062W
3083	4822 051 30101	100Ω 5% 0.062W
3084	4822 051 30101	100Ω 5% 0.062W
3086	4822 051 30222	2.2kΩ 5% 0.062W
3087	4822 051 30103	10kΩ 5% 0.062W
3088	4822 051 30332	3.3Ω 5% 0.062W
3089	4822 051 30154	150kΩ 5% 0.062W
3091	4822 051 30101	100Ω 5% 0.062W
3092	4822 051 30472	4.7Ω 5% 0.062W
3093	4822 051 30472	4.7Ω 5% 0.062W
3094	4822 051 30109	10Ω 5% 0.062W
3096	4822 051 30332	3.3Ω 5% 0.062W
3097	4822 051 30472	4.7Ω 5% 0.062W
3101	4822 051 30151	150Ω 5% 0.062W
3102	4822 117 12891	220kΩ 1%
3103	4822 051 30223	22kΩ 5% 0.062W
3104	4822 117 12925	47kΩ 1% 0.063W 0603
3105	4822 051 30151	150Ω 5% 0.062W
3106	4822 117 12891	220kΩ 1%
3107	4822 051 30223	22kΩ 5% 0.062W
3108	4822 117 12925	47kΩ 1% 0.063W 0603
3109	4822 051 30759	75Ω 5% 0.062W
3110	4822 051 30101	100Ω 5% 0.062W
3111	4822 051 30273	27kΩ 5% 0.062W
3112	4822 051 30682	6.8Ω 5% 0.062W
3113	4822 051 30759	75Ω 5% 0.062W
3114	4822 051 30101	100Ω 5% 0.062W
3115	4822 051 30759	75Ω 5% 0.062W
3116	4822 051 30101	100Ω 5% 0.062W
3117	4822 051 30759	75Ω 5% 0.062W
3118	4822 051 30101	100Ω 5% 0.062W
3119	4822 051 30689	68Ω 5% 0.063W 0603
3120	4822 051 30102	1kΩ 5% 0.062W
3121	4822 051 30759	75Ω 5% 0.062W
3122	4822 051 30101	100Ω 5% 0.062W
3302	4822 051 30101	100Ω 5% 0.062W
3303	4822 051 30101	100Ω 5% 0.062W
3309	4822 051 30103	10kΩ 5% 0.062W
3311	4822 051 30103	10kΩ 5% 0.062W
3314	4822 117 13632	100kΩ 1% 0603 0.62W
3315	4822 051 30154	150kΩ 5% 0.062W
3316	4822 117 12968	820Ω 5% 0.62W
3317	4822 051 30561	560Ω 5% 0.062W
3319	4822 051 30273	27kΩ 5% 0.062W
3320	4822 051 30183	18kΩ 5% 0.062W
3321	4822 051 30222	2.2kΩ 5% 0.062W
3322	4822 051 30682	6.8Ω 5% 0.062W
3323	4822 051 30222	2.2kΩ 5% 0.062W
3327	4822 051 30102	1kΩ 5% 0.062W
3359	4822 051 30391	390Ω 5% 0.062W
3370	4822 051 30681	680Ω 5% 0.062W
3371	4822 051 30101	100Ω 5% 0.062W
3372	4822 051 30101	100Ω 5% 0.062W
3374	5322 117 11726	10Ω 5%
3375	4822 051 30101	100Ω 5% 0.062W
3389	4822 051 30101	100Ω 5% 0.062W
3390	4822 051 30101	100Ω 5% 0.062W
3391	4822 051 30101	100Ω 5% 0.062W
3394	4822 051 30759	75Ω 5% 0.062W
3401	4822 051 30103	10kΩ 5% 0.062W
3402	4822 051 30103	10kΩ 5% 0.062W
3403	4822 051 30151	150Ω 5% 0.062W
3404	4822 051 30103	10kΩ 5% 0.062W
3405	4822 051 30103	10kΩ 5% 0.062W
3406	4822 051 30103	10kΩ 5% 0.062W
3407	3198 031 13390	33Ω 5% 1206
3408	3198 031 13390	33Ω 5% 1206
3409	3198 031 13390	33Ω 5% 1206
3410	3198 031 13390	33Ω 5% 1206
3411	3198 031 13390	33Ω 5% 1206
3412	3198 031 13390	33Ω 5% 1206
3413	3198 031 13390	33Ω 5% 1206
3414	4822 051 30103	10kΩ 5% 0.062W
3416	4822 051 30101	100Ω 5% 0.062W
3417	4822 051 30103	10kΩ 5% 0.062W
3418	4822 051 30103	10kΩ 5% 0.062W
3419	4822 051 30103	10kΩ 5% 0.062W
3420	4822 051 30103	10kΩ 5% 0.062W
3421	4822 051 30103	10kΩ 5% 0.062W
3422	4822 051 30103	10kΩ 5% 0.062W
3423	4822 051 30103	10kΩ 5% 0.062W
3424	3198 031 11030	10kΩ 5% 1206
3427	3198 021 31080	1Ω 5% 0603
3428	3198 021 31080	1Ω 5% 0603
3430	4822 051 30101	100Ω 5% 0.062W
3431	4822 051 30101	100Ω 5% 0.062W
3433	4822 051 30103	10kΩ 5% 0.062W
3434	4822 051 30103	10kΩ 5% 0.062W
3435	4822 051 30103	10kΩ 5% 0.062W
3441	4822 051 30101	100Ω 5% 0.062W
3442	4822 051 30101	100Ω 5% 0.062W
3443	4822 051 30103	10kΩ 5% 0.062W
3444	4822 051 30103	10kΩ 5% 0.062W
3463	4822 051 30101	100Ω 5% 0.062W
3464	4822 051 30101	100Ω 5% 0.062W
3467	4822 051 30222	2.2kΩ 5% 0.062W
3468	4822 051 30222	2.2kΩ 5% 0.062W
3469	4822 051 30151	150Ω 5% 0.062W
3470	4822 051 30103	10kΩ 5% 0.062W
3471	4822 117 12968	820Ω 5% 0.62W
3472	4822 051 30759	75Ω 5% 0.062W
3473	4822 051 30759	75Ω 5% 0.062W
3474	4822 051 30759	75Ω 5% 0.062W
3475	4822 117 12139	22Ω 5% 0.062W
3476	4822 117 12139	22Ω 5% 0.062W
3477	4822 117 12139	22Ω 5% 0.062W
3478	4822 117 13632	100kΩ 1% 0603 0.62W
3479	4822 117 12139	22Ω 5% 0.062W
3480	4822 117 12139	22Ω 5% 0.062W
3481	4822 051 30102	1kΩ 5% 0.062W
3482	4822 051 30102	1kΩ 5% 0.062W
3483	4822 051 30103	10kΩ 5% 0.062W
3484	4822 051 30103	10kΩ 5% 0.062W
3496	4822 117 12139	22Ω 5% 0.062W
3497	4822 117 12139	22Ω 5% 0.062W
3498	4822 117 12139	22Ω 5% 0.062W
3499	4822 117 12139	22Ω 5% 0.062W
3501	4822 051 30103	10kΩ 5% 0.062W
3502	4822 051 30221	220Ω 5% 0.062W
3503	4822 051 30221	220Ω 5% 0.062W
3504	4822 051 30221	220Ω 5% 0.062W
3505	4822 051 30221	220Ω 5% 0.062W
3506	4822 051 30221	220Ω 5% 0.062W
3507	4822 051 30221	220Ω 5% 0.062W
3510	4822 051 30221	220Ω 5% 0.062W
3511	4822 051 30221	220Ω 5% 0.062W
3512	4822 051 30221	220Ω 5% 0.062W
3513	4822 051 30221	220Ω 5% 0.062W
3519	2422 549 42896	Bead 120Ω 100MHz
3520	4822 051 30333	33kΩ 5% 0.062W
3706	4822 051 30103	10kΩ 5% 0.062W
3717	4822 051 30103	10kΩ 5% 0.062W
3719	4822 051 30103	10kΩ 5% 0.062W
3722	5322 117 13056	8.2kΩ 1% 0.063W 0603
3725	4822 051 30103	10kΩ 5% 0.062W
3726	4822 051 30392	3.9Ω 5% 0.063W 0603
3727	4822 051 30392	3.9Ω 5% 0.063W 0603
3730	4822 051 30102	1kΩ 5% 0.062W
3732	4822 051 30102	1kΩ 5% 0.062W
3744	5322 117 13056	8.2kΩ 1% 0.063W 0603
3745	5322 117 13056	8.2kΩ 1% 0.063W 0603
3910	4822 051 30222	2.2kΩ 5% 0.062W
3911	4822 051 30102	1kΩ 5% 0.062W
3930	3198 021 31080	1Ω 5% 0603
3932	2322 704 61002	1kΩ 1%
3933	2322 704 63302	3.3kΩ 1% 0603
3934	3198 021 31080	1Ω 5% 0603
3935	3198 021 31080	1Ω 5% 0603
3936	4822 051 30102	1kΩ 5% 0.062W
3937	2306 207 03151	150Ω 5% 0.5W
3955	4822 051 30103	10kΩ 5% 0.062W
3958	4822 051 30102	1kΩ 5% 0.062W

–~~–

5002	2422 549 44197	Bead 220Ω at 100MHz
5003	4822 157 11716	Bead 30Ω at 100MHz
5004	4822 157 11716	Bead 30Ω at 100MHz
5005	4822 157 11716	Bead 30Ω at 100MHz
5006	4822 157 11716	Bead 30Ω at 100MHz
5007	2422 549 44197	Bead 220Ω at 100MHz
5008	2422 549 44197	Bead 220Ω at 100MHz
5009	2422 536 00667	1000µF 20% 7032
5010	3198 018 51090	10µH 10% 0603
5011	3198 018 51090	10µH 10% 0603
5012	3198 018 51090	10µH 10% 0603
5013	3198 018 64790	47µF 5% 1008
5060	2422 549 44197	Bead 220Ω at 100MHz
5070	4822 157 11716	Bead 30Ω at 100MHz
5071	2422 549 42896	Bead 120Ω 100MHz
5072	2422 549 42896	Bead 120Ω 100MHz
5321	3198 018 33970	0.39µF 10% 0805
5324	4822 157 71334	0.68µH 5% 1008
5370	4822 157 11716	Bead 30Ω at 100MHz
5371	4822 157 11716	Bead 30Ω at 100MHz
5372	2422 549 44197	Bead 220Ω at 100MHz
5401	4822 157 11717	Bead 50Ω at 100MHz
5402	4822 157 11717	Bead 50Ω at 100MHz
5403	4822 157 11717	Bead 50Ω at 100MHz
5404	4822 157 11717	Bead 50Ω at 100MHz
5462	4822 157 11717	Bead 50Ω at 100MHz
5520	4822 157 11716	Bead 30Ω at 100MHz
5706	4822 157 11716	Bead 30Ω at 100MHz
5910	2422 536 00667	1000µF 20% 7032
5920	2422 549 45333	Bead 120Ω 100MHz
5930	2422 535 94639	10µH 20%
5931	2422 536 00689	220µF 20%
5932	2422 535 94639	10µH 20%
5956	2422 549 45333	Bead 120Ω 100MHz
5957	2422 549 45333	Bead 120Ω 100MHz
5958	2422 549 45333	Bead 120Ω 100MHz
5959	2422 549 45333	Bead 120Ω 100MHz
5961	2422 549 45333	Bead 120Ω 100MHz

–▷|–

6002	4822 130 11397	BAS316
6005	4822 130 11397	BAS316
6006	4822 130 11397	BAS316

6060	9322 102 64685	UDZ2.7B
6061	4822 130 11397	BAS316
6073	4822 130 80622	BAT54
6076	4822 130 80622	BAT54
6310	4822 130 11397	BAS316
6323	4822 130 11525	1SS356
6460	9322 193 16685	KDR721S
6910	5322 130 34337	BAV99
6911	9340 548 71115	PDZ33B
6930	9322 128 70685	SMSS14

7001	3198 010 43130	BC807-25
7002	3198 010 42310	BC847BW
7003	3198 010 43130	BC807-25
7004	3198 010 42310	BC847BW
7005	9322 208 05668	NE555D
7006	9322 208 05668	NE555D
7007	9322 208 05668	NE555D
7011	9352 761 83557	TDA15021H/N1A11
7012	3198 010 42310	BC847BW
7013	3198 010 42310	BC847BW
7014	3198 010 42310	BC847BW
7015	5322 130 60159	BC846B
7016	5322 130 60159	BC846B
7060	4822 130 11155	PDTC114ET
7061	9340 547 13215	BSH103
7070	9340 547 13215	BSH103
7099	4822 209 17226	M24C08-WMN6
7101	5322 130 60159	BC846B
7316	5322 130 42718	BFS20
7320	3198 010 42310	BC847BW
7370	9340 550 49115	PUMH7
7401	9322 210 77671	GM5221-LF-BC
7402	9322 156 81668	M24C32-WMN6TNKSA
7403	9322 205 12671	MX29LV040QC-70G
7404	4822 130 11155	PDTC114ET
7461	9322 199 80668	SM5301BS-G
7462	9322 145 26668	M24C02-WMN6
7463	4822 209 60792	74HC4053D
7510	9352 607 39118	74LVC14APW
7520	9322 212 97668	MK1575-01G
7702	3198 010 42310	BC847BW
7703	3198 010 42310	BC847BW
7706	9352 500 20118	74LVC08AD
7710	3198 010 42310	BC847BW
7712	9352 683 73118	TDA1517ATW/N1
7910	4822 130 42804	BC817-25
7920	9322 163 24668	L78M08CDT
7930	5322 209 90529	MC34063AD
7936	4822 130 41087	BC638
7953	9322 199 25668	L4940D2T12
7954	9322 157 51685	SI12301DS
7955	9322 189 19668	LD1086D2T18

Side I/O Panel [D]

Various

1101	4822 267 10484	YKF51-5359
1102	4822 265 10658	Soc 3P
1105	2422 025 09406	Connector 4p m
1106	2422 026 05059	Connector Phone
1107	4822 267 10637	Connector 5p
1108	2422 025 10771	Connector 10p m
1111	2422 025 09406	Connector 4p m
1112	2422 025 10768	Connector 3p m

2101	3198 016 31510	150pF 10% 50V 0603
2102	3198 016 31510	150pF 10% 50V 0603
2103	4822 126 13881	470pF 5% 50V
2104	4822 126 13881	470pF 5% 50V
2107	3198 016 31020	1nF 25V 0603
2108	3198 016 31020	1nF 25V 0603
2109	3198 016 31020	1nF 25V 0603
2110	3198 016 31020	1nF 25V 0603
2111	4822 124 12245	220µF 20% 10V
2112	4822 124 12245	220µF 20% 10V
2113	4822 126 13881	470pF 5% 50V
2114	4822 126 13881	470pF 5% 50V
2117	2020 552 96305	4.7µF 20-80% 10V

3101	4822 051 30109	10Ω 5% 0.062W
3103	4822 051 30109	10Ω 5% 0.062W
3104	4822 051 30759	75Ω 5% 0.062W
3105	4822 051 30759	75Ω 5% 0.062W
3106	4822 051 30759	75Ω 5% 0.062W
3107	4822 051 30223	22kΩ 5% 0.062W
3108	4822 117 12925	47kΩ 1% 0.063W 0603
3109	4822 051 30223	22kΩ 5% 0.062W
3110	4822 117 12925	47kΩ 1% 0.063W 0603
3115	4822 051 30121	120Ω 5% 0.062W
3116	4822 051 30121	120Ω 5% 0.062W
3123	4822 051 30101	100Ω 5% 0.062W
3124	4822 051 30101	100Ω 5% 0.062W
3125	4822 051 30102	1kΩ 5% 0.062W
3126	4822 051 30183	18kΩ 5% 0.062W
3127	4822 051 30183	18kΩ 5% 0.062W

61xx	4822 130 11148	UDZ4.7B

7101	4822 130 60373	BC856B

Top Control [E]

Various

1309	4822 276 13775	Switch 1p 0.1A 12V
1310	4822 276 13775	Switch 1p 0.1A 12V
1311	4822 276 13775	Switch 1p 0.1A 12V
1312	4822 276 13775	Switch 1p 0.1A 12V
1313	4822 276 13775	Switch 1p 0.1A 12V
8308▲	3139 110 27581	Cable 2p 180

3318	4822 051 30151	150Ω 5% 0.062W
3319	4822 051 30391	390Ω 5% 0.062W
3320	4822 117 12903	1.8kΩ 1% 0.063W 0603
3321	4822 117 12968	820Ω 5% 0.62W
3322	4822 051 30008	Jumper 0603
3323	4822 051 30008	Jumper 0603

6306	4822 130 11148	UDZ4.7B

Audio Amplifier Panel [H]

Various

1703	2422 025 17117	Connector 2p m
1704	2422 025 16966	Connector 5p m
1706	2422 025 16702	Connector 5p m

2703	4822 124 23002	10µF 16V
2712	3198 017 41050	1µF 10V 0603
2713	2238 586 59812	100nF 20% 50V 0603
2714	2020 021 91871	470µF 20% 16V
2715	2020 021 91871	470µF 20% 16V
2718	3198 017 41050	1µF 10V 0603
2719	2238 586 59812	100nF 20% 50V 0603
2741	4822 126 13881	470pF 5% 50V
2742	4822 126 13881	470pF 5% 50V
2746	3198 017 41050	1µF 10V 0603

3701	4822 051 30332	3.3Ω 5% 0.062W
3702	4822 051 30332	3.3Ω 5% 0.062W
3706	4822 051 30103	10kΩ 5% 0.062W
3714	5322 117 13056	8.2kΩ 1% 0.063W 0603
3715	4822 117 12903	1.8kΩ 1% 0.063W 0603
3726	5322 117 13056	8.2kΩ 1% 0.063W 0603
3727	4822 117 12903	1.8kΩ 1% 0.063W 0603
3744	4822 051 30103	10kΩ 5% 0.062W
3746	4822 051 30103	10kΩ 5% 0.062W
3747	4822 051 30103	10kΩ 5% 0.062W
3748	4822 051 30103	10kΩ 5% 0.062W
3749	4822 051 30103	10kΩ 5% 0.062W
3750	4822 051 30682	6.8Ω 5% 0.062W
3751	4822 051 30682	6.8Ω 5% 0.062W

5709	4822 157 11716	Bead 30Ω at 100MHz
5710	4822 157 11716	Bead 30Ω at 100MHz

7703	9340 425 20115	BC847BS
7709	9322 206 09668	TDA7297D

LED & IR [J]

Various

1870	4822 265 31067	Connector 7p m

2801	2020 552 96637	10µF 10% 6.3V 0805
2802	2020 552 96637	10µF 10% 6.3V 0805

3801	4822 051 30332	3.3Ω 5% 0.062W
3802	4822 051 30331	330Ω 5% 0.062W
3803	4822 051 30221	220Ω 5% 0.062W

6801	9322 192 35676	SPR-325MVW

7801	4822 130 60373	BC856B
7802	9322 207 16667	TSOP34836LL1B
7803	5322 130 60159	BC846B
7804	5322 130 60159	BC846B

11. Revision List

Manual xxxx xxx xxxx.0

- First release.